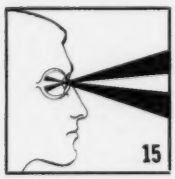
UNITED STATES ARMY MARCH 1974

AVIATION DIGEST

Owl Team members provide an inside look at tactical night NOE flying on pages 2 and 3

UNITED STATES ARMY AVIATION DIGEST

MARCH 1974 VOLUME 20 NUMBER 3



NOE At Night 2

Getting Started, CW2 Ralph S. Park 3

The Army Test Pilot, LTC Roger W. Waddell 6

A Windy Reminder, 1LT Jon P. Kahler, USAF 10

I Learned From That Flight, CPT Louis E. Fausak 12

Aeromedic—Night Train, MAJ Rush R. Wicker 15

Getting That University Degree, Donald J. Nolan 18

Views From Readers 26

Instrument Corner 29

Light Of My Life 44

USAASO Sez 48

VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
UNITED STATES ARMY

DIRECTOR OF ARMY AVIATION, ACSFOR DEPARTMENT OF THE ARMY
BG James H. Merryman

COMMANDANT, U. S. ARMY AVIATION SCHOOL
MG William J. Maddox Jr.

ASST COMDT, U. S. ARMY AVIATION SCHOOL
BG James M. Leslie

EDITOR, U. S. ARMY AVIATION DIGEST
Richard K. Tierney

ABOUT THE COVER

"Owl Team" members share their night nap-of-the-earth (NOE) flight experiences. See pages 2 and 3

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of the Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

This publication has been approved by Headquarters Department of the Army, 1 September 1973.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-5 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220. For any change in distribution requirements, initiate a revised DA Form 12-5.

National Guard and Army Reserve units under pinpoint distribution also should submit DA Form 12-5. Other National Guard units should submit requests through their state adjutants general.

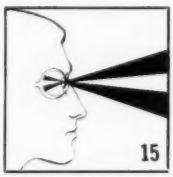
Those not eligible for official distribution or who desire personal copies of the DIGEST can order the magazine from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Annual subscription rates are $13.40 domestic and $16.75 overseas. Single copies are $1.20.

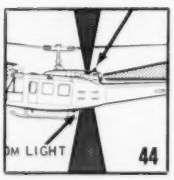
UNITED STATES ARMY AVIATION

MARCH 1974 VOLUME 20 NUMBER 3

6

10


15


44

NOE At Night 2

Getting Started, CW2 Ralph S. Park 3

The Army Test Pilot, LTC Roger W. Waddell 6

A Windy Reminder, 1LT Jon P. Kahler, USAF 10

I Learned From That Flight, CPT Louis E. Fausak 12

Aeromedic—Night Train, MAJ Rush R. Wicker 15

Getting That University Degree, Donald J. Nolan 18

Views From Readers 26

Instrument Corner 29

Light Of My Life 44

USAASO Sez 48

VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
UNITED STATES ARMY

DIRECTOR OF ARMY AVIATION, ACSFOR DEPARTMENT OF THE ARMY
BG James H. Merryman

COMMANDANT, U. S. ARMY AVIATION SCHOOL
MG William J. Maddox Jr.

ASST COMDT, U. S. ARMY AVIATION SCHOOL
BG James M. Leslie

EDITOR, U. S. ARMY AVIATION DIGEST
Richard K. Tierney

ABOUT THE COVER

"Owl Team" members share their night nap-of-the-earth (NOE) flight experiences. See pages 2 and 3

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of the Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

This publication has been approved by Headquarters Department of the Army, 1 September 1973.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-5 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220. For any change in distribution requirements, initiate a revised DA Form 12-5.

National Guard and Army Reserve units under pinpoint distribution also should submit DA Form 12-5. Other National Guard units should submit requests through their state adjutants general.

Those not eligible for official distribution or who desire personal copies of the DIGEST can order the magazine from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Annual subscription rates are $13.40 domestic and $16.75 overseas. Single copies are $1.20.

We've been tinkering with night operations since World War II. We have talked about them. We have written about them. We have even launched successful operations in training and combat. Somehow, in the turmoil of expansion and combat, we failed to orient our units to the necessity for directing time and effort to night operations. Our excursions in this direction have been shallow. The recent Middle East War vividly forced us to face reality. It accents the need for Army aviation to develop the tactics, techniques, doctrines, SOPs and materiel for continuous, successful night operations.

The challenge is not new. In the November 1967 issue of AVIATION DIGEST, Lieutenant Colonel Bill Fraker sounded a warning in his article "Night Is Our Friend." He chided units that were purely daylight oriented and cautioned against the chaos and embarrassment that would be encountered if forced to fight at night. Then in 1972, CDEC's "Owl Team" came to grips with the problem of night operations and won praise for its contributions in developing night low level techniques. Orville Wright has interviewed five members of the Owl Team; this is recorded on page 2 of this issue. Then on page 3, CW2 Ralph S. Park shares his night Owl Team experiences with us. MASSTER has worked diligently and contributed greatly to the night operations effort.

Today, we are meeting the challenge. One step forward was a recent change to AR 95-1 which increased night flying minimums from 10 to 20 hours. At the U. S. Army Aviation Center night flying for advanced rotary wing students was boosted from 9 to 15 hours. More is in the offing including night low level training in the manner of the "Night Owls."

Last autumn's war in the Middle East echoes a new urgency for Army aviation to intensify night training as individuals and as teams. Aviation's potential contribution to the combined arms team can be realized only if we can operate effectively at night. Success in this endeavor depends largely on you. Enthusiasm must spring from everyone in Army aviation—commanders, aviators, researchers, controllers—the medics, the maintenance men, the records keepers—everyone!

Let's get excited about night combat operations. Then we'll write the sequel to LTC Fraker's penetrating article of 1967.

MAJOR GENERAL WILLIAM J. MADDOX, JR.

Orval talks with members of the 155th Aviation Company "Owl Team" about flying

USAAAVS

NOE AT NIGHT

ORVAL RIGHT, CHIEF ADVISOR ON MATTERS OF AVIATION, U. S. ARMY AGENCY FOR AVIATION SAFETY: *Recently, a group of 12 Army aviators from the 155th Aviation Company attached to the U. S. Army Combat Developments Experimentation Command (CDEC) adopted my nocturnal habits for a night aviation training experiment and nicknamed themselves the "Owl Team." It was reported that the "Owl Team" had flown 1,800 accident-free hours at nap-of-the-earth (NOE) and low-level altitudes at night at Hunter Liggett Military Reservation, CA. This was especially interesting because of the terrain at Hunter Liggett. There the trees reach out and grab anything flying 150 to 200 feet off the deck, often leaving an actual clearance of only 50 feet or less between the vegetation and helicopter. The terrain also varies from gently rolling valleys to rugged, mountainous terrain. Because of the Owl Team's unique work, I made a special trip to Hunter Liggett to interview the remaining team personnel who had participated in the experiment to learn how they safely accomplished their night NOE flying. Personnel interviewed were Major Richard L. Cox, Major Frederick A. Isgrig, and CW2s Robert L. Wolff, Donald L. Choura, Joe L. Jackson, John B. Cole and Craig W. Stiff. Because of other duties, Colonel Billy L. Odneal, the team chief, was not available to participate in this interview. Comments of the participants are personal opinions and do not necessarily reflect official CDEC conclusions or Department of the Army doctrine.*

ORVAL: I understand that the "Owl Team" aviators volunteered for the Attack Helicopter Clear Night Defense Experiment and that they had the option of withdrawing from the training at any time. Were there any specific requirements or qualifications they had to meet?

CHOURA: There were no specific requirements. Aviator flight experience ranged from 400 to 500 to several thousand flight hours. With the exception of one aviator who had flown with the Night Hawks overseas, none of us had any specific night training. However, our eyes were examined thoroughly for any serious defects in night vision.

ISGRIG: To amplify Mr. Choura's statement, a test was given for night myopia [nearsightedness] and an attempt was made to get special lenses prescribed to correct any special refractive problems [visual distortion] that occurred during scotopic [dim light]

Continued on page 31

GETTING STARTED

CW2 Ralph S. Park

This night antiarmor program was exploratory in nature and although the "Owl Team" used "standard" Army aviators, it is not implied that this capability exists within operational units. Users of these findings are CAUTIONED that in order to attain these capabilities deliberate, step-by-step procedures must be instituted to ensure the safe progression to the desired baseline. Units must be willing to dedicate personnel and equipment to assure this safe progression.

The author was awarded the 1973 James H. McClellan Aviation Safety Award for his development and initiation of the Owl Team's comprehensive training program into the realm of the night nap-of-the-earth to expand Army aviation's capabilities into areas which were previously considered only marginally safe but into which we MUST operate in the mid-intensity tactical environment.

[Editor's note: It is imperative that prior to night flight the crew ensures that canopies on AH-1 aircraft and windshields on utility and observation aircraft be checked for cleanliness.]

IN JUNE 1972 the 155th Aviation Company (Attack Helicopter) conducted exploratory training for the Combat Developments Experimentation Command (CDEC), specifically Experiment 43.7 entitled "The Attack Helicopter in the Clear Night Defense." The purpose was to determine capabilities of the present attack helicopter team (AHT) concept in a night antiarmor role. The unit had recently completed a series of experiments which clearly demonstrated the importance of the AHT in the daylight mid-intensity warfare environment.

Although nap-of-the-earth (NOE) techniques had been well established for daylight operations,

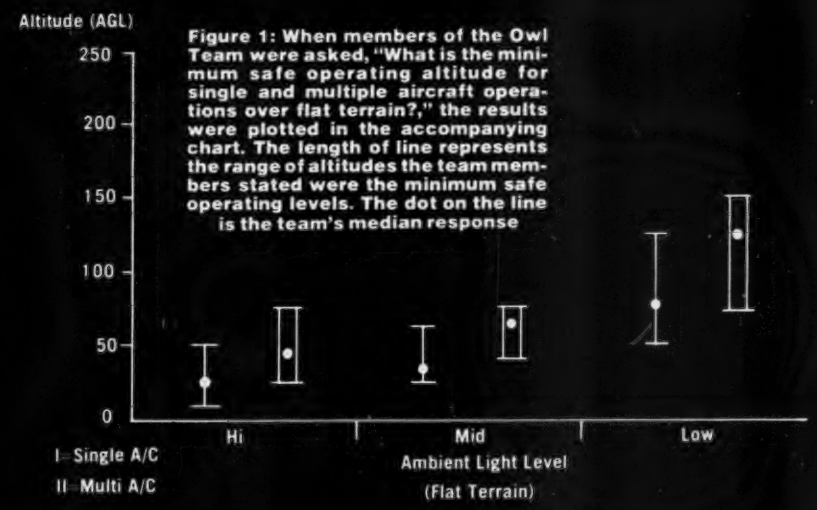


Figure 1: When members of the Owl Team were asked, "What is the minimum safe operating altitude for single and multiple aircraft operations over flat terrain?," the results were plotted in the accompanying chart. The length of line represents the range of altitudes the team members stated were the minimum safe operating levels. The dot on the line is the team's median response

it was difficult to visualize their night application on the terrain at Hunter Liggett Military Reservation, CA. Located in the Santa Lucia mountain range, the terrain varies from flat to rolling to ruggedly mountainous and is heavily vegetated with trees as tall as 175 feet. The concept, however, was intriguing. The training plan emphasized safety and control and the unit would be in effect developing its own training program that would progress only as the necessary skills were gained.

Army-wide research proved that except for some work done by Project MASSTER (Modern Army Selected Systems Test Evaluation and Review) at Ft. Hood, TX, little was known about night nap-of-the-earth flying. A visit to the 1st Squadron, 9th Cavalry provided valuable background information from which the training program was developed.

Twelve aviators, commissioned and warrant officers, were selected from within the unit. Their night proficiency was representative of

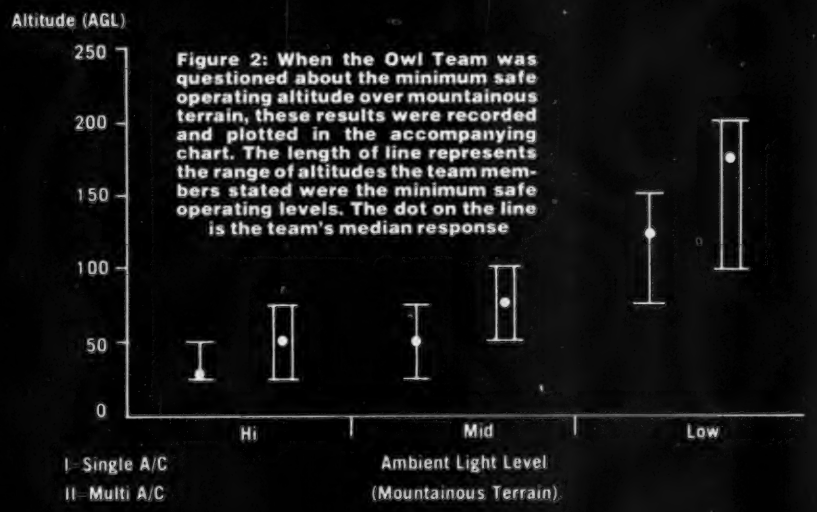


Figure 2: When the Owl Team was questioned about the minimum safe operating altitude over mountainous terrain, these results were recorded and plotted in the accompanying chart. The length of line represents the range of altitudes the team members stated were the minimum safe operating levels. The dot on the line is the team's median response

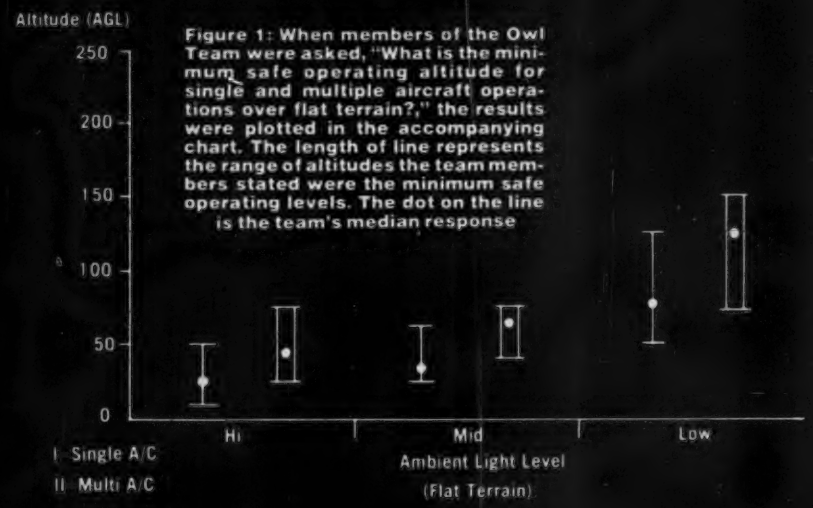


Figure 1: When members of the Owl Team were asked, "What is the minimum safe operating altitude for single and multiple aircraft operations over flat terrain?," the results were plotted in the accompanying chart. The length of line represents the range of altitudes the team members stated were the minimum safe operating levels. The dot on the line is the team's median response

it was difficult to visualize their night application on the terrain at Hunter Liggett Military Reservation, CA. Located in the Santa Lucia mountain range, the terrain varies from flat to rolling to ruggedly mountainous and is heavily vegetated with trees as tall as 175 feet. The concept, however, was intriguing. The training plan emphasized safety and control and the unit would be in effect developing its own training program that would progress only as the necessary skills were gained.

Army-wide research proved that except for some work done by Project MASSTER (Modern Army Selected Systems Test Evaluation and Review) at Ft. Hood, TX, little was known about night nap-of-the-earth flying. A visit to the 1st Squadron, 9th Cavalry provided valuable background information from which the training program was developed.

Twelve aviators, commissioned and warrant officers, were selected from within the unit. Their night proficiency was representative of

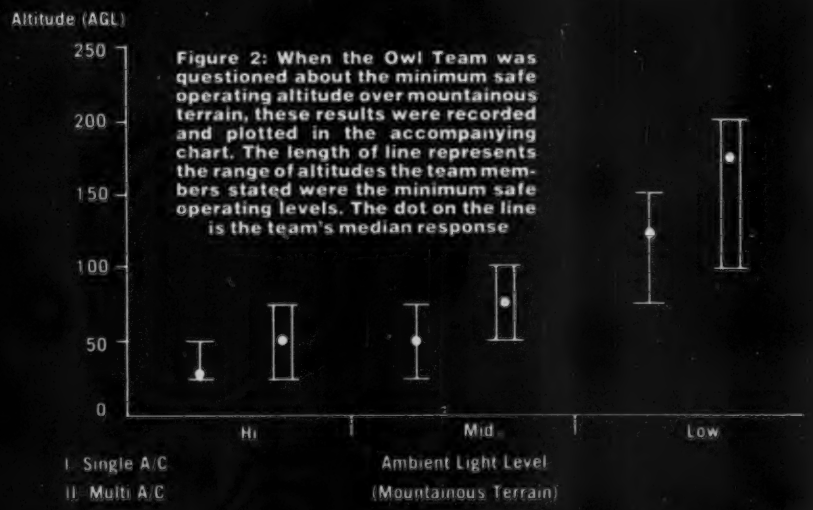


Figure 2: When the Owl Team was questioned about the minimum safe operating altitude over mountainous terrain, these results were recorded and plotted in the accompanying chart. The length of line represents the range of altitudes the team members stated were the minimum safe operating levels. The dot on the line is the team's median response

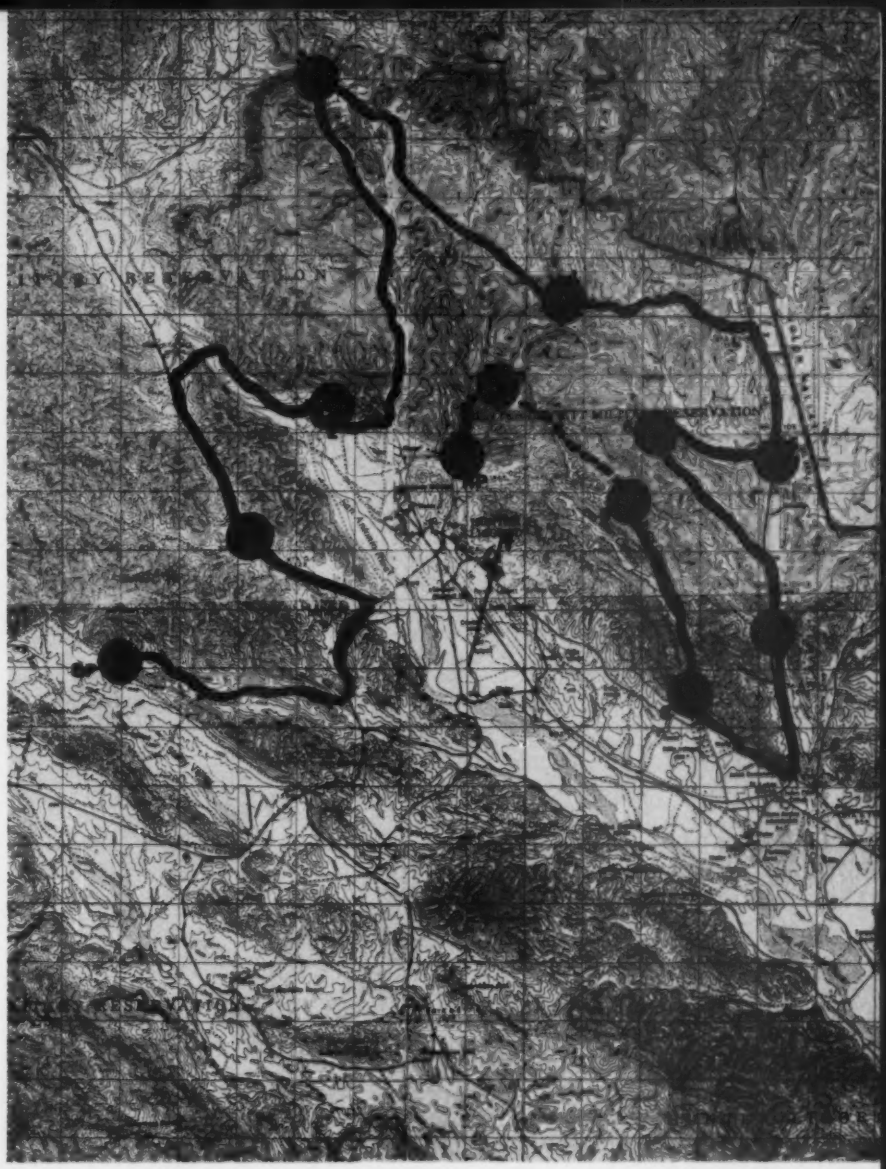


Figure 3: A typical flight route. Start points, air control points, release points and the actual intended flight path are depicted on the map before the night mission begins

aviators found in TOE units throughout the Army in that only 7 percent of their previous total flight time had been accomplished during the hours of darkness.

These aviators, dubbed the "Owl Team," were truly volunteers and had the option of individually withdrawing from the training at any time with no stigma attached.

The training program began with relatively simple, single aircraft cross-country night navigation flights and local area traffic pattern work. As night proficiency and confidence were gained, we methodically proceeded to the more difficult multiple aircraft operations at lower altitudes. Concurrently, about 30 hours of classroom instruction was presented on the psychological and physiological stresses and effects of night NOE flying, mission planning, map reading and terrain interpretation, aircraft characteristics, emergency procedures, threat, organization and tactics, and other related subjects.

A training matrix was developed as a means to record the date proficiency was achieved in each task. The goal was to establish the minimum safe levels which would become the baseline operational altitudes.

We arbitrarily defined low light levels as being less than 2.5 times 10 to the minus 4 footcandles which related to periods of no moon. Midlight approximated new moon to one-half moon and highlight was one-half moon or greater. We attempted to avoid undertaking new tasks during periods of lowlight. A photometer located at the heliport measured the existing light levels each night.

When we were able to demonstrate an acceptable degree of proficiency in a given altitude band, a checkride was administered with a *do not exceed* altitude restriction by cadre control personnel employing both visual observation and the M-33 surveillance radar to precisely measure navigational accuracy. Three months after initiating the program we were routinely operating with the unaided eye at our baseline altitudes. [Editor's note: CDEC's report states that about 80 hours of flight training are required to attain this degree of proficiency.]

Figure 1 depicts the responses received when the team was asked: What is the minimum safe operating altitude for single and multiple aircraft operations over flat terrain? The length of the line represents the range of altitudes the teammembers stated were the minimum safe operating levels. The dot on the line presents the median re-

Continued on page 20

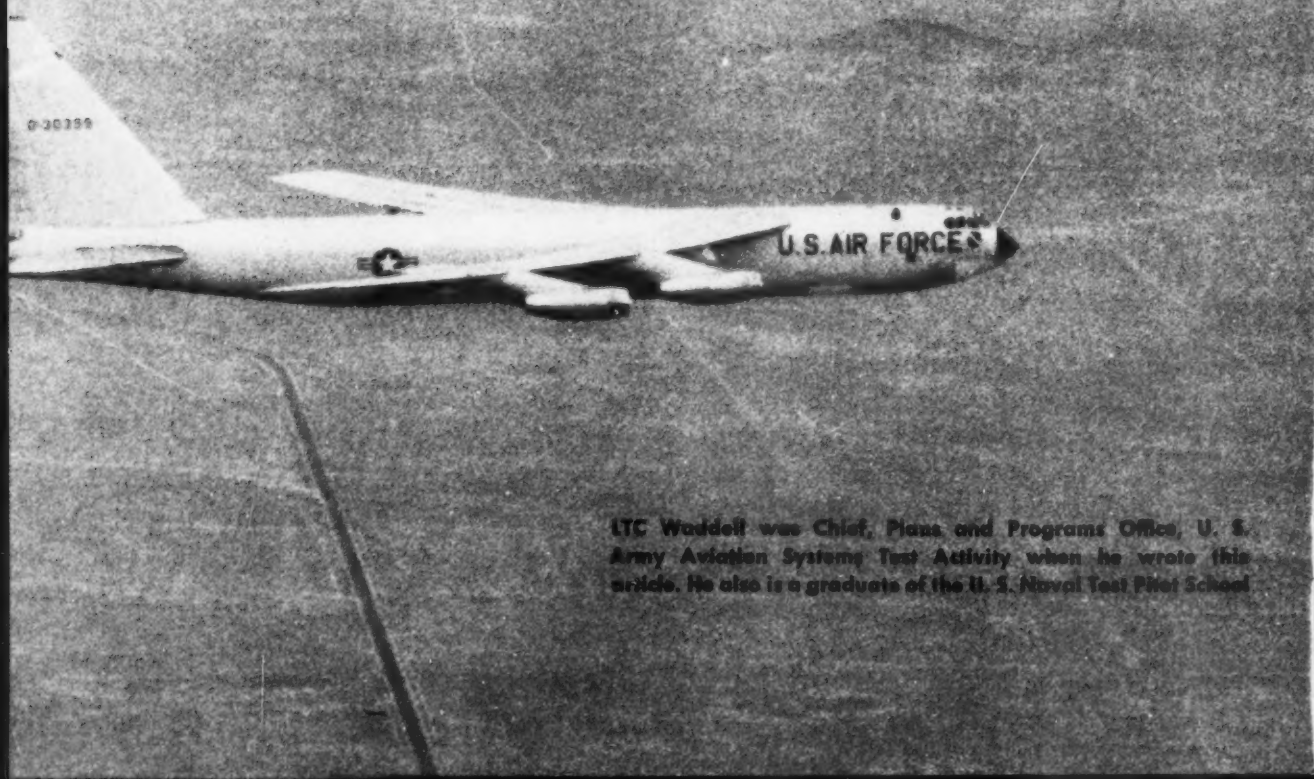
THERE ARE MANY decisions or events that play important parts in deciding the course a person's military career will follow. But, how many of these decisions are made and how many of these events are actually influenced or caused by the individual whose career is developing? All too often it seems we are like leaves being blown by the winds of chance with little or no control over our own destinies. People are continually searching for ways to move their careers in the direction they want to go.

Not long ago I sat at my desk thinking about my career in the Army. More specifically, I looked back over my career in Army aviation and wondered if I would do anything different if I had a chance to start over. Perhaps I would just like to be able to reenter my career at some particular point right here today. After some thought I decided the only major decision that I had made to influence my aviation career was to apply for the U. S. Naval Test Pilot School (USNTPS) over 5 years ago. Why did I choose that course of action? Would I do it again? What motivates a person to get into the Army Aviation Engineering and Flight Testing Program or, as I will call it, the test pilot program?

I was motivated by the same factors that motivate most people who want to be test pilots. Primarily, I thought that it would be interesting and challenging to have a part in the development and acquisition of new aircraft. I also felt that being a test pilot would provide a background that would be useful in the research and development field and I was interested in entering that career specialty. I wanted to move my career in the direction of the more technical aspects of aviation. Also, I knew I could learn a lot just by attending the test pilot school for I knew the school had a challenging curriculum in both flying and academics. That the school is not a breeze is substantiated by the fact that since the first two Army aviators entered USNTPS in 1960 approximately 29 percent failed to complete it.

After pondering over these motivating factors for a few moments, I decided that they were all still valid reasons for entering the test pilot program and that my decision to do so was a good one. I just wished that instead of being a guy who had been rated for more than 14 years and had started test pilot school 5 years ago that I was a young captain or CW2 rated just long enough to have 1,500 hours of flight time with at least 500 hours in both rotary wing and fixed wing aircraft. Then, if I had extensive experience in the UH-1, AH-1, CH-47 or CH-54 and had a good background in engineering and mathematics, I would be applying for entrance to the test pilot school at a much better time in my career.

Opportunity is knocking right now for an aviator with the qualifications I just mentioned to play an important part in the testing of the utility tactical transport aircraft system (UTTAS), the advanced attack helicopter (AAH), and the heavy lift helicopter (HLH). Test-



LTC Waddell was Chief, Plans and Programs Office, U. S. Army Aviation Systems Test Activity when he wrote this article. He also is a graduate of the U. S. Naval Test Pilot School

The course at USNTPS is 1 year long with two classes per year and the next class starts in July. Additional information may be obtained from the Specialty Management Branch of the Office of the Deputy for Professional Development and Plans in the Officer Personnel Directorate and from your career branch. The mailing address and telephone numbers for the Specialty Management Branch are:

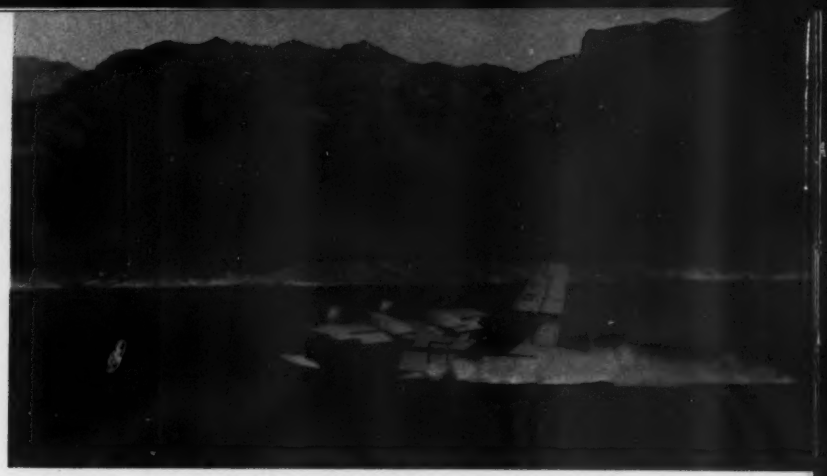
Commander, Military Personnel Center
ATTN: DAPC-OPD-PD-SM
200 Stovall Street
Alexandria, Virginia 22332

AUTOVON 221-0250/0251/0252
Commercial 202-325-XXXX

You may also contact the Army liaison officer at USNTPS at Patuxent River, MD, or the Director of Flight Test at USAASTA. Or, if you happen to be traveling in the vicinity of Edwards AFB, stop by USAASTA and see for yourself what type work is going on there.

The Army Test Pilot

Lieutenant Colonel Roger W. Waddell



Army aviation test pilots on a given week might find themselves flying a seaplane, or as seen on the bottom of page 9...

ing of these aircraft will begin in the summer of 1975 and will continue for more than 3 years. BUT WAIT! Before you throw this magazine aside and start filling out your application for the test pilot school there is a little more you should know. I have more to say about the business of flight testing, the organization which is responsible for the engineering flight test of Army aircraft and some of the personal challenges in the test pilot program.

First, let us take a brief look at the organization which performs the engineering flight tests of Army aircraft. The U.S. Army Aviation Systems Test Activity (USAASTA) is located at Edwards Air Force Base, CA, and is a subordinate activity of the U.S. Army Aviation Systems Command (AVSCOM). The activity was organized at Edwards AFB as the Aviation Test Office under the U.S. Army Transportation Materiel Command in March 1960. At that time the organization consisted of 4 officers and 28 civilians; currently, the activity is authorized 26 officers, 1 warrant officer, 33 enlisted men and 104 civilians. The mission of USAASTA is to:

Plan and conduct airworthiness qualification flight tests of air vehicles developed and/or procured as integrated systems; airworthiness evaluations of those vehicles proposed or considered for Army application or incorporating advanced concepts having potential military application.

Produce quantitative test data on aircraft performance, stability and control, maintainability and reliability.

Conduct an Army Test Pilot Orientation Course.

Extensive test facilities and equipment and many test support functions are required to fulfill that mission. The Air Force Flight Test Center (AFFTC) provides many test facilities and considerable administrative and logistical support for USAASTA. In addition to Edwards AFB, testing is conducted at several remote sites. These include two airports—Shafter-Kern and Meadows (elevations under 500 feet MSL) near Bakersfield, CA, and the airport at Bishop, CA (elevation 4,112 feet), as well as other test sites near Bishop with elevations up to 11,400 feet. Testing also is accomplished at Yuma Proving Ground, AZ, and Alamosa, CO, and at contractor facilities.

Tests at remote sites may be supported by local agencies or by USAASTA and AFFTC, depending on location. Much of the special equipment required for flight testing is that which is used to record and process data. Modernization of USAASTA equipment has included the development of an advanced instrumentation and data analysis system (AIDAS) which includes an airborne data package, a central computer complex and three self-contained mobile vans with computer systems similar to the central but with less storage capability and less extensive peripheral equipment. This equipment will permit either onboard magnetic tape recording or real time telemetry transmission of data. The AIDAS ground station equipment provides automatic data handling and processing capabilities to include preparation of data plots suitable for final reports. This is but one example of the changes in instrumentation and equipment that have taken place over the years to better equip USAASTA to accomplish its mission.

Although USAASTA does most of the engineering flight testing of Army aircraft and is the best place for a new test pilot to be assigned, it should be pointed out that test pilots are also authorized in other organizations: the U.S. Army Air Mobility Research and Development Laboratory at the Ames, Eustis and Langley Directorates, as well as in some of the AMC project managers' offices. There also is one Army test pilot on the staff of the U.S. Naval Test Pilot School.

Now, how about this business of flight testing? Well, it has certainly changed from what it was in October 1903 when test pilot Charles M. Manly hoped to demonstrate the world's first sustained airplane flight in a craft which had been invented by Dr. Samuel Pierpont Langley. According to the account in Sherwood Harris' *The First To Fly—Aviation's Pioneer Days,* Dr. Langley's airplane was to be launched in the Potomac River from what "resembled a warehouse floating on a barge." In preparation for the flight, Test Pilot Manly even

strapped a compass to his leg so he could find his way back to the boat if his flight was so long that he got lost. Unfortunately, the attempt to fly was unsuccessful. *The Washington Post's* description of the flight was: "There was a roaring, grinding noise and the Langley airship tumbled over the edge of the houseboat and disappeared into the river 16 feet below. It simply slid into the water like a handful of mortar." Today, military test pilots may encounter some strange things but usually nothing like this. Army test pilots fly a new aircraft early in its development, perhaps 6 to 8 months after the first flight, but not before it has been adequately demonstrated by the contractor. Tests which are performed are generally made within a flight envelope which has already been explored.

Flight testing also is quite unlike that which took place in the U.S. Air Force early in the jet age or that involving the X-15 when the names of many of the test pilots and their exploits were well known. Today, there is little glamour in the tasks of the test pilot. However, one similarity between flight testing then and now is that there is a lot of hard work involved.

Much of the testing requires takeoff shortly after sunrise to have smooth, stable air aloft or winds less than 3 knots on the surface. There is very little "wringing out" of the aircraft. Instead, most tests require long periods of holding steady, stabilized flight conditions. And because of the nature of flight testing, most test pilots do not do a lot of flying. Much more time is spent in planning and data analysis than in flying. Finally, the product of the entire test team's efforts is the written technical test report which is the result of hours of writing, review and revision. With all this drudgery what are the rewards of being a test pilot?

There is considerable variation in what people consider to be rewards so it is hard to generalize, but I will name some things which most people consider to be rewarding. First, a test pilot can see tangible results of his efforts and know that he is making a contribution to the Army's materiel acquisition process. As a minimum he produces a written report that bears his name and is going to be read by people who must make decisions based, in part, on the test pilot's findings. Also, he has the opportunity to expand his technical knowledge of aircraft and related systems. A test pilot's time is pretty well occupied when he is involved in a project but by taking the time to find out what other people are doing there is an opportunity to gain a wealth of knowledge from the experience of others as well as from his own projects. Finally, a test pilot can expect the challenge of performing a variety of tasks and working with a wide range of equipment.

It does not take too much knowledge of the Army's aviation resources to know that only a small portion of the engineering flight test workload over the past several years has been testing of new aircraft. That is one reason why so many new aircraft are just over the horizon. Most of the flight testing of recent years has been directed toward evaluating modifications of existing aircraft, determining the capability of these aircraft to perform new missions with the installation of new equipment and determining the affect of new subsystems and equipment on the handling qualities and performance of existing aircraft. Often these tests are made to determine the airworthiness of the test item and to establish a flight envelope in which some other test agency can perform user tests. Occasionally, the test pilot will monitor contractor tests instead of actually performing the tests.

Recent engineering flight tests conducted by USAASTA have covered a wide range of flight and calendar time and complexity. At one extreme is an OV-1C test supporting a National Aeronautics and Space Administration accident investigation. It consisted of one flight of 1.4 hours. At the other extreme is the testing of the AH-1Q TOW Cobra. These tests consisted of the Army preliminary evaluation (APE) and the airworthiness and flight characteristics (A&FC) evaluation which together required a total of 64 flights with 55.7 productive flight hours. The APE took about 1 month in September and October 1972 and the A&FC evaluation took 2 months between April and June 1973. Although I mention the TOW Cobra tests there have been others which have taken considerably more

Continued on page 25

... the next week the Army's test pilots could well be flying a UH-1 Huey with a spraying device

IV.	TERMINAL FORECASTS				
DESTINATION	CLOUD LAYERS	VIS/WEA	SFC WIND	ALTIMETER	VALID TIME
GRF	250D	7	2810G20	3010 INS	1700 Z TO 1900 Z
ALTERNATE				INS	Z TO Z
INTMED STOP				INS	Z TO Z
INTMED STOP				INS	Z TO Z
V.	COMMENTS/REMARKS				
OCNL MDT TURBC SFC-40					

A Windy Reminder

1LT Jon P. Kahler, USAF

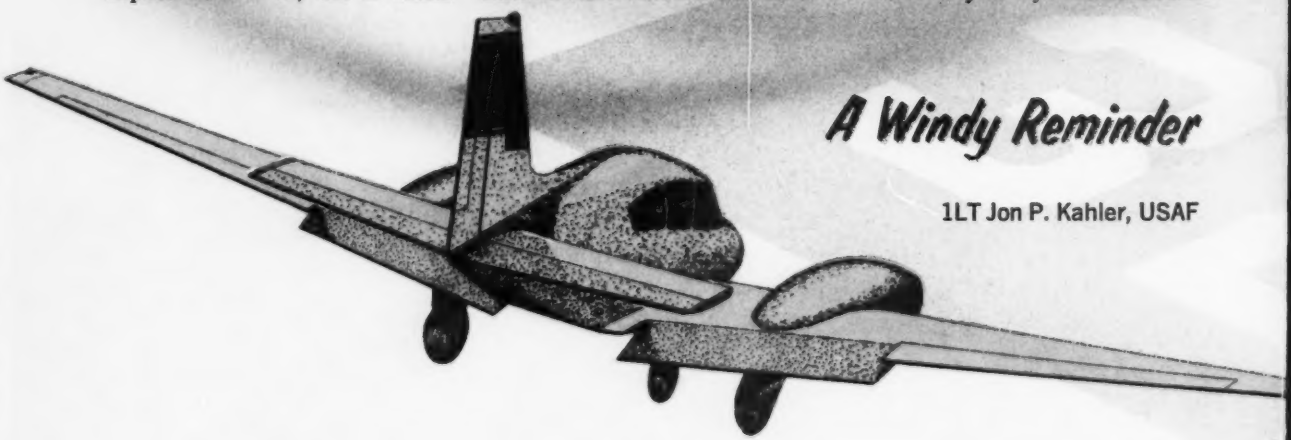
ABOVE IS A FORECAST that was entered in section IV of a DD Form 175-1: The forecast surface winds could be strong enough to exceed the maximum crosswind component of most fixed wing Army aircraft depending on the runway direction.

Gray Army Airfield, Ft. Lewis, WA, has runways 5-23 and 14-32. For the purpose of illustration, let's assume that runway 5-23 is closed for repairs and the pilot filing to Gray AAF is required to use runway 32. The angular difference between the 320-degree runway heading and the 280-degree wind forecast is 40 degrees. This converts to approximately 13 knots of crosswind using the maximum forecast wind of 20 knots. If the airplane is a T-42, this is within the 15-knot maximum crosswind allowed. Right? . . . *Wrong!*

In this particular case there is a 22-degree *easterly magnetic variation* for the destination. Since forecast winds are true and runway headings are magnetic, the computed angular difference between runway heading and wind was incorrect. The forecast *true* winds must first be converted into magnetic. Remember from flight school the saying when changing from true to magnetic: east is least (subtract) and west is best (add)? The forecast true wind of 280 degrees becomes 258 degrees magnetic and the angular difference formerly computed to be 40 degrees would, in fact, be 62 degrees. Using a 62-degree angular difference and a maximum forecast wind of 20 knots, the conversion for crosswind component now results in about 17 knots, which exceeds the 15-knot limit for the T-42.

As you can see from this illustration, knowing that a wind forecast on the DD Form 175-1 is reported as true and being aware of the magnetic deviations in the areas where you fly, there can sometimes be a significant difference in what may be expected when you land—and how you land.

Magnetic variations occur almost everywhere to some degree so be certain to check the Flight Information Publication (FLIP) high and low altitude and the operational navigation charts (ONC) to determine the variation that exists whenever you fly to unfamiliar



areas. The probability that there is a significant variation at any given place is quite high.

The following rules should clear up most doubts concerning true or magnetic with respect to any winds you may be given:

• Winds given by METRO (pilot to military weather voice call) will be magnetic when reporting local surface condition, but true winds will be given when relaying surface observations from other installations and winds aloft; however, magnetic winds will be given and so identified only when there is a reportable difference between the magnetic and true headings.

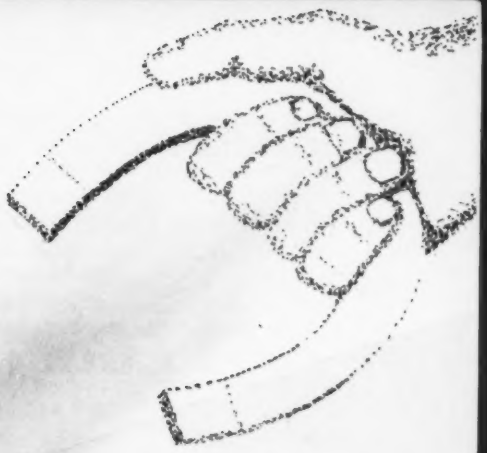
• Local surface winds disseminated with the local observation over closed circuit television or electrowriter *and* local surface winds communicated by tower or approach control are magnetic.

• All winds entered on the DD Form 175-1 are true. This includes flight level winds and surface winds for destination, alternate and intermediate stops.

• Winds, whether forecast or observed, are always true on all information disseminated over teletype. Some stations having significant magnetic variation also will give the magnetic wind direction in the remarks section of their teletype sequence report.

• Any time you get forecast or observed winds for a station other than the one at which you are, you will get true winds regardless of who provides the information.

To put it simply, magnetic winds are given only for observed surface winds at the local station. If you are ever in doubt as to whether the winds you have been provided are true or magnetic, by all means *ask!* It could mean the difference between exceeding or not exceeding your aircraft's maximum crosswind component.



...on DD Form 175-1, wind forecasts are reported as true, and magnetic deviations can sometimes create a significant difference in what you may expect on touchdown

If you do most or all of your flying in an area where there is little or no magnetic variation from true north, there is no need to be particularly or immediately concerned about true versus magnetic; however, you should be aware of the importance of this anomaly all the same. After all, who can say for certain that he won't someday be scheduled for an extended cross-country flight into an area where there is a variation? If you are scheduled for such a flight you wouldn't want to begin your approach only to find that you've figured your crosswind component using a true wind direction and then determine that you cannot land because your maximum crosswind is exceeded! On the other hand, if you routinely fly in an area where there is a significant variation, you should already be distinctly aware of the problem of magnetic versus true.

I Learned From That Flight

Captain Louis E. Fausak

It is often said that the day a pilot doesn't learn something new is the day he should quit flying ... Captain Fausak discusses some of the lessons he learned from a night flight in the mountains

THE RETURN FLIGHT from Ft. Huachuca, AZ, to Ft Carson, CO, promised to be a pleasant uneventful experience similar to the trip down. The Ft. Carson Flying Club's Bonanza functioned perfectly on the way down to Arizona and the weatherman had just promised a CAVU (ceiling and visibility unlimited) flight back to Colorado.

The Flying Club's maintenance supervisor was my "copilot" for the trip and was quite adept at plotting courses and getting VOR fixes even though he was not a pilot. For experience we filed an IFR flight plan at Ft. Huachuca to the "muni" at Colorado Springs: Peterson Field. We planned to leave about 1 hour after nightfall with a 3½-hour flight to the Springs. Normal procedure was to file for Colorado Springs, and then cancel IFR when Butts Army Airfield at Ft. Carson was in sight.

We filed for 11,000 feet and began the long flight home. When we reached altitude we leveled off and let the Bonanza accelerate to its 75 percent cruise speed—about 180 miles per hour. Our transponder was talking to everyone loud and clear because Albuquerque Center answered our initial call-up with the controller's security-blanket transmission, "Radar contact."

We drove up V-202 to Truth or Consequences, NM, and then started north along V-19. The checkpoints were hitting right on our estimates, and I decided that the slight tailwind which had been forecast had materialized.

As the Bonanza banked to the right over the Albuquerque VORTAC (VOR and TACAN navigational facilities—collocated) to track out on V-190 toward Las Vegas, NM (not Nevada), a feeling of "something isn't right" started making itself known somewhere way down in the gray matter. A quick scan of the engine instruments failed to reveal any problems, and I returned to the attitude portion of the panel.

My copilot asked, "Wasn't that Albuquerque we just went over?"

"Roger that," I replied. "We have about 40 miles to go and we should be able to see the rotating beacon at Las Vegas."

"I didn't even see the lights of Albuquerque," my staunch copilot answered.

That was the problem. I had gotten up "on top" of a layer and had not realized it. The lack of ground lights in that part of the country had not bothered me until I found out that we had just passed over a major city without any visual recognition.

I asked Center to leave the frequency for a few minutes (the second communications radio was in the shop) and dialed in 122.1 while turning up the volume on the VOR.

"Albuquerque Radio, this is Beechcraft 7095N, listening 113.-2."

"Beech 7095N, Albuquerque Radio, go ahead."

"Beech 7095N is on an IFR flight plan from Libby Army Airfield to Colorado Springs; estimating Colorado Springs at 0600 zulu. Requesting current and forecast Colorado Springs weather."

"Roger, Beech 7095N. Colorado Springs is reporting 7,000 scattered variable broken, 100 miles visibility. Its forecast indicates that it will stay about the same until well after your arrival."

Colorado Springs is about 6,000 feet mean sea level and I remember

thinking that the reported 7,000-foot layer would be at about 13,000 feet mean sea level.

I settled back slightly, knowing that I would not be making an instrument approach into the Springs, and that we would be able to land at Ft. Carson. A major consideration—our cars were parked at the Flying Club on Butts Field.

We crossed the Las Vegas VORTAC and received the following call from Albuquerque Center: "Beech N7095N, climb and maintain one-three thousand. Contact the Denver Center, one-two-six-point-one, at zero-five-two-zero-zulu."

"This is Beech 7095N. Out of one-two thousand. Denver Center, one-twenty-six-one at two-zero past. Goodnight, sir."

We continued up V-81, crossed the Cimarron VORTAC and at 20 minutes after 10 called Denver Center.

"Denver Center, Bonanza N7-095N, one-three thousand."

No answer.

No problem, either. We would be in range of the remote site in a few more minutes and would be able to talk with Denver.

The weather was getting a little worse at our altitude and our Bonanza was ducking in and out of the lower level of a cloud layer which had formed above us. Probably, I thought, the same layer Colorado Springs was reporting when we talked with Albuquerque Flight Service Station (FSS).

We tried a few more calls and as we crossed Gordon intersection, still without contact, I realized we had a minor problem.

I would have felt a lot more comfortable if we could get below the clouds. The outside air temperature gauge was right on the 0 degree C. mark, and we both knew that there was water in those clouds. (Like, how does one see ice at night, looking through some clouds at a white-winged airplane with a flashlight?)

We were too far away from Albuquerque to attempt a contact with them by this time, so I did not follow the procedure of trying to gain contact with the last station. A look at the chart told us that we were almost directly over Trinidad and I decided to contact Trinidad FSS and tell them our problem—and have the FSS ask Denver Center for a lower altitude for us.

"Trinidad Radio, Beechcraft 7095N, 123.6, over."

Nothing.

"Trinidad Radio, Beechcraft 7095N, 122.6, over."

Nothing.

"Trinidad Radio, Beechcraft 7095N, 122.2, over."

Nothing. We dialed in 122.1 and turned up the sound on the ADF.

"Trinidad Radio, Beechcraft 7095N, listening Trinidad nondirectional beacon, 329 kilohertz, over."

Well, since all else had failed we tried 121.5.

"Any station, Beechcraft 7095N on guard. Listening 121.5, Pueblo VOR, and 329 kilohertz, over."

Still nothing!

O. K., we are neither transmitting nor receiving. The next step is to turn up the volume on the navigation radios, put the lost commo code—7600—in the transponder and wait for someone to talk to us.

We were getting more "in" than "out" of the clouds, so based on normal procedures the next time we were "out" we descended to maintain VFR.

Even though both our navigation radios (the VOR and an ADF) were emitting a steady stream of dots and dashes and now and then some weather information, we did not hear a friendly voice from any of the stations acknowledging that we had a problem. After 80 nautical miles with 7600 in the transponder, and within range of two navaids, we made the slight course adjustment as we crossed the Pueblo VORTAC for the final 40 miles to Colorado Springs.

About halfway to the Springs I tuned the Colorado Springs VOR with the hope that we could get some indication of the active runway there. No luck!

We were down to 9,500 feet at this point, and I could see the approach and visual approach slope indicator lights for runway 35 at Peterson Field.

I tuned the localizer frequency for runway 35, and identified the locator outer marker on the ADF. My plan was to intercept the localizer and then land on runway 35 regardless of the wind. I knew that 35 was over 11,000 feet long, and even a direct tailwind would not be a major problem.

I told my copilot, who was just as interested in the situation as I was by this time, to watch the localizer needle and when it centered to put 7700 in the transponder. I had a gnawing thought that if we were landing in the wrong direction a 707 or some equally unfriendly

A Fort Rucker Flying Club Beechcraft Sundowner

bird might be coming up to meet us.

The localizer needle started off full-scale deflection and we committed to the approach. Out of the corner of my eye I saw my copilot's hand move toward the transponder. At that moment the loudest transmission I have ever heard over an aircraft radio bounced around the cockpit, "Beech 7095N, if you are receiving Colorado Springs Approach Control ident."

We both jumped at the "ident" button on the transponder and were overjoyed to hear, "Roger your ident, Beech 95N. You are cleared to land, runway 35. Winds 340 degrees at 6, altimeter 3007."

The remainder of the flight and the landing went without incident. However, on the drive home from the airport some questions kept running through my mind:

• Why did I waste time trying to contact Trinidad FSS when we were obviously (to anyone who was not in the cockpit at that time) "lost commo"?

• Why did I maintain my altitude in an "in and out" condition when icing could have been a problem—and when the regs say, in effect, "if you're VFR, *stay* VFR"?

• Why was there no attempt to re-contact Albuquerque Center? As it turned out later (though I cannot explain why) the radio was able to transmit on the frequency we were using for Albuquerque Center.

• And, finally, what was I doing in the mountains, night IFR, in a single-engine airplane with only one radio? For instance, what kind of trouble would I have been in if both the communications *and* navigation sections of the radio went "poof" while we were going through those mountains just east of Albuquerque?

I learned from that flight. My mountain flying is now strictly "day-VFR" and those "optional courses of action" take most of the time spent in preflight planning rather than just a small portion of the time.

I learned from that . . . and I hope that you will use my experience to help stay out of trouble.

The DIGEST welcomes this contribution from Captain Fausak and would like to hear from other members of Army Flying Clubs. Below is a list of many Army Flying Clubs

Ft. Rucker Flying Club Cairns AAF (Ozark), AL	100/130 115/145	(205) 255-6228 AV 558-6228
Ft. Greely Flying Club Allen AAF, AK	80/87	(907) 872-1138 AV 317-872-1138
Ft. Huachuca Aero Club Tucson, AZ	80/87 100/130 115/145	(602) 538-5993 AV 879-5993
Ft. Ord Flying Club Salinas, CA	80/87 115/145	(408) 242-5451 AV 973-5451
Ft. Carson Flying Club Butts AAF Colorado Spgs, CO	115/145	(303) 576-7024 AV 691-3603
Ft. Gordon Flying Club Bushfield, GA	80/100	(404) 798-5338
Ft. Stewart Flying Club Savannah, GA	80/87 115/145 JP-4	(912) 352-6523 AV 971-2115
Ft. Sheridan Army Flying Club Wheeling, IL		(312) 634-3460
Ft. Leavenworth Army Flying Club Ft. Leavenworth, KS	80/87	(913) 684-2825 AV 552-2825
Ft. Riley Flying Club Marshall AAF Junction City, KS	80/87 115/145	(913) 239-2205 AV 856-2205
Ft. Knox Aero Club Ft. Knox, KY	80	(502) 624-3189 AV 464-3189
Ft. Polk Army Flying Club Ft. Polk, LA	80/87	(318) 578-4659
Aberdeen Proving Ground Flying Club Aberdeen, MD	80	(301) 278-4902
Ft. Meade Flying Club Ft. Meade, MD	80	(301) 677-3663
Ft. Leonard Wood Aero Club Waynesville, MO	80/87 100/130	(314) 368-6968
Ft. Monmouth Flying Club Monmouth County Airport, NJ	80/87 100/130 115/145	(201) 938-5886
West Point Flying Club Newburgh, NY		(914) 562-1324
Red Leg Flying Club Ft. Sill, OK	80/87	(405) 351-2765 AV 639-4601
NCAD Aero Club Harrisburg State Airport Carlisle, PA	U. S. War College Opns	(717) 245-3305
Camp A. P. Hill Aero Club Camp A. P. Hill, VA	115/145 Landing use for emergency only	(703) 934-3600 Ext 203 (after hours Ext 201)
Ft. Lee Aero Club Hopewell, VA	Service from FBO	
Ft. Lewis Army Aero Club Tacoma, WA	80/87 115/145	(206) 968-2752

MAN INVARIABLY fears the unknown . . . hesitates in the face of uncertainty. But, man is adaptable . . . often flexible to the needs of a given situation, particularly if he is trained to maximize his capabilities and minimize his limitations. The use of vision and establishment of visual scanning techniques is amenable to training . . . also to continued research.

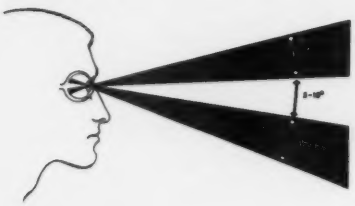
Prior knowledge of visual scanning techniques and their successful application is likely buried in the archives and memories of past armed conflict. Such is the implication of older, operational medical literature. The time to unearth such seemingly unsophisticated razzle is now. No sense re-inventing the wheel, but equally important no sense blindly accepting them as valid either. Each old or new concept should be subjected to careful laboratory and field scrutiny and investigation.

One of the more time honored techniques of training pertains to dark adaptation and night seeing techniques. The emergence of NOE demands that these be reexamined and readapted. The U. S. Army Aviation Center has provided specific visual training in the "Night Vision Orientation" using a two-dimensional training device for several years. Most of the Aviation Center's students have now received this foundation to build upon in the operational environment. That the accompanying article is written by an aviator perhaps attests that this program has had a favorable impact. Each member of the aviation team must now apply his night vision training. Time to develop dark adaptation and utilization of procedures for protection of dark adaptation must be considered if maximal use of our full capability is to be realized for increased mission performance and efficiency.

Even in the face of sophisticated electronics and assisted sensory perception these techniques are important. The ultimate cockpit system is man. When the electronic and photic systems fail he must be prepared as the final backup system.

NICHOLAS E. BARRECA, M.D.
LTC, MC, SFS
CDR, Army Aeromedical Activity,
U.S. Army MEDDAC,
Fort Rucker, AL 36360

Aeromedic



Night Train

Major Rush R. Wicker

Doctrine Division
Deputy for Developments
United States Army Aviation Center
Fort Rucker, Al

IN 1492 CHRISTOPHER Columbus set sail from Spain. His en route planning included only a direction because he was uncertain how long his trip would take. Many of his friends considered him insane for it was a common belief that the end of the world was just beyond the horizon.

Hesitancy on the part of early explorers to venture off into the unknown existed due to a lack of experience, knowledge and equipment to accomplish the voyage. Fortunately, as the early explorers became more familiar with navigation techniques their fear of the unknown was overcome. As a result they gained more confidence which led to more extensive travel. This analogy describes the present thinking of many of our Army aviators relating to night nap-of-the-earth (NOE) flight.

The uncertainty which existed in the minds of early sea captains exists today in the minds of many Army aviators. In the past only limited night operations have been conducted; however, changes in technology and tactics require the ground commander to conduct extensive combat operations at night. To support the maneuver forces the aviator must possess the capability to effectively pilot his helicopter at low altitudes during hours of darkness.

In July 1972 a group of 12 Army aviators par-

bird might be coming up to meet us.

The localizer needle started off full-scale deflection and we committed to the approach. Out of the corner of my eye I saw my copilot's hand move toward the transponder. At that moment the loudest transmission I have ever heard over an aircraft radio bounced around the cockpit, "Beech 7095N, if you are receiving Colorado Springs Approach Control ident."

We both jumped at the "ident" button on the transponder and were overjoyed to hear, "Roger your ident, Beech 95N. You are cleared to land, runway 35. Winds 340 degrees at 6, altimeter 3007."

The remainder of the flight and the landing went without incident. However, on the drive home from the airport some questions kept running through my mind:

• Why did I waste time trying to contact Trinidad FSS when we were obviously (to anyone who was not in the cockpit at that time) "lost commo"?

• Why did I maintain my altitude in an "in and out" condition when icing could have been a problem—and when the regs say, in effect, "if you're VFR, *stay* VFR"?

• Why was there no attempt to re-contact Albuquerque Center? As it turned out later (though I cannot explain why) the radio was able to transmit on the frequency we were using for Albuquerque Center.

• And, finally, what was I doing in the mountains, night IFR, in a single-engine airplane with only one radio? For instance, what kind of trouble would I have been in if both the communications *and* navigation sections of the radio went "poof" while we were going through those mountains just east of Albuquerque?

I learned from that flight. My mountain flying is now strictly "day-VFR" and those "optional courses of action" take most of the time spent in preflight planning rather than just a small portion of the time.

I learned from that . . . and I hope that you will use my experience to help stay out of trouble.

The DIGEST welcomes this contribution from Captain Fausak and would like to hear from other members of Army Flying Clubs. Below is a list of many Army Flying Clubs

Ft. Rucker Flying Club Cairns AAF (Ozark), AL	**100/130 115/145**	**(205) 255-6228 AV 558-6228**
Ft. Greely Flying Club Allen AAF, AK	**80/87**	**(907) 872-1138 AV 317-872-1138**
Ft. Huachuca Aero Club Tucson, AZ	**80/87 100/130 115/145**	**(602) 538-5993 AV 879-5993**
Ft. Ord Flying Club Salinas, CA	**80/87 115/145**	**(408) 242-5451 AV 973-5451**
Ft. Carson Flying Club Butts AAF Colorado Spgs, CO	**115/145**	**(303) 576-7024 AV 691-3603**
Ft. Gordon Flying Club Bushfield, GA	**80/100**	**(404) 798-5338**
Ft. Stewart Flying Club Savannah, GA	**80/87 115/145 JP-4**	**(912) 352-6523 AV 971-2115**
Ft. Sheridan Army Flying Club Wheeling, IL		**(312) 634-3460**
Ft. Leavenworth Army Flying Club Ft. Leavenworth, KS	**80/87**	**(913) 684-2825 AV 552-2825**
Ft. Riley Flying Club Marshall AAF Junction City, KS	**80/87 115/145**	**(913) 239-2205 AV 856-2205**
Ft. Knox Aero Club Ft. Knox, KY	**80**	**(502) 624-3189 AV 464-3189**
Ft. Polk Army Flying Club Ft. Polk, LA	**80/87**	**(318) 578-4659**
Aberdeen Proving Ground Flying Club Aberdeen, MD	**80**	**(301) 278-4902**
Ft. Meade Flying Club Ft. Meade, MD	**80**	**(301) 677-3663**
Ft. Leonard Wood Aero Club Waynesville, MO	**80/87 100/130**	**(314) 368-6968**
Ft. Monmouth Flying Club Monmouth County Airport, NJ	**80/87 100/130 115/145**	**(201) 938-5886**
West Point Flying Club Newburgh, NY		**(914) 562-1324**
Red Leg Flying Club Ft. Sill, OK	**80/87**	**(405) 351-2765 AV 639-4601**
NCAD Aero Club Harrisburg State Airport Carlisle, PA	**U. S. War College Opns**	**(717) 245-3305**
Camp A. P. Hill Aero Club Camp A. P. Hill, VA	**115/145 Landing use for emergency only**	**(703) 934-3600 Ext 203 (after hours Ext 201)**
Ft. Lee Aero Club Hopewell, VA	**Service from FBO**	
Ft. Lewis Army Aero Club Tacoma, WA	**80/87 115/145**	**(206) 968-2752**

MAN INVARIABLY fears the unknown . . . hesitates in the face of uncertainty. But, man is adaptable . . . often flexible to the needs of a given situation, particularly if he is trained to maximize his capabilities and minimize his limitations. The use of vision and establishment of visual scanning techniques is amenable to training . . . also to continued research.

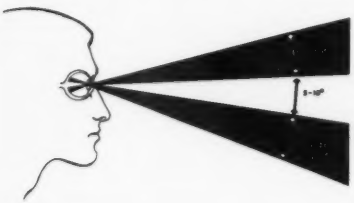
Prior knowledge of visual scanning techniques and their successful application is likely buried in the archives and memories of past armed conflict. Such is the implication of older, operational medical literature. The time to unearth such seemingly unsophisticated razzle is now. No sense re-inventing the wheel, but equally important no sense blindly accepting them as valid either. Each old or new concept should be subjected to careful laboratory and field scrutiny and investigation.

One of the more time honored techniques of training pertains to dark adaptation and night seeing techniques. The emergence of NOE demands that these be reexamined and readapted. The U. S. Army Aviation Center has provided specific visual training in the "Night Vision Orientation" using a two-dimensional training device for several years. Most of the Aviation Center's students have now received this foundation to build upon in the operational environment. That the accompanying article is written by an aviator perhaps attests that this program has had a favorable impact. Each member of the aviation team must now apply his night vision training. Time to develop dark adaptation and utilization of procedures for protection of dark adaptation must be considered if maximal use of our full capability is to be realized for increased mission performance and efficiency.

Even in the face of sophisticated electronics and assisted sensory perception these techniques are important. The ultimate cockpit system is man. When the electronic and photic systems fail he must be prepared as the final backup system.

NICHOLAS E. BARRECA, M.D.
LTC, MC, SFS
CDR, Army Aeromedical Activity,
U.S. Army MEDDAC,
Fort Rucker, AL 36360

Aeromedic



Night Train

Major Rush R. Wicker

Doctrine Division
Deputy for Developments
United States Army Aviation Center
Fort Rucker, Al

IN 1492 CHRISTOPHER Columbus set sail from Spain. His en route planning included only a direction because he was uncertain how long his trip would take. Many of his friends considered him insane for it was a common belief that the end of the world was just beyond the horizon.

Hesitancy on the part of early explorers to venture off into the unknown existed due to a lack of experience, knowledge and equipment to accomplish the voyage. Fortunately, as the early explorers became more familiar with navigation techniques their fear of the unknown was overcome. As a result they gained more confidence which led to more extensive travel. This analogy describes the present thinking of many of our Army aviators relating to night nap-of-the-earth (NOE) flight.

The uncertainty which existed in the minds of early sea captains exists today in the minds of many Army aviators. In the past only limited night operations have been conducted; however, changes in technology and tactics require the ground commander to conduct extensive combat operations at night. To support the maneuver forces the aviator must possess the capability to effectively pilot his helicopter at low altitudes during hours of darkness.

In July 1972 a group of 12 Army aviators par-

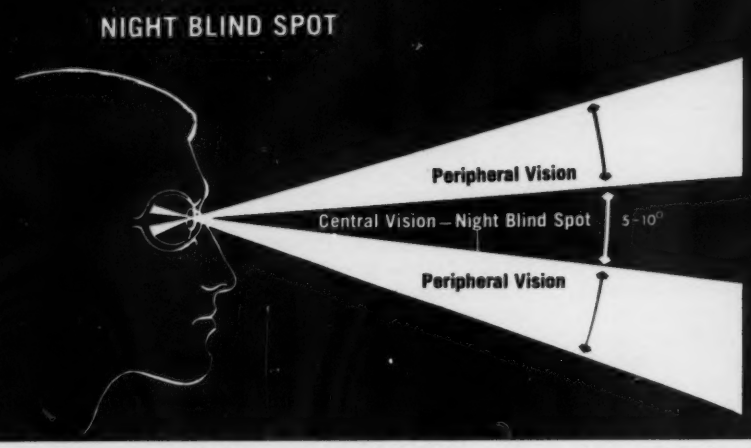


Figure 1

Since the cones of central vision are insensitive to low level illumination, a central night blind spot of 5 to 10 degrees projects from each eye into the field of vision

ticipated in tests relating to night NOE. You might say these aviators were the Christopher Columbus' of night NOE. These tests were conducted by the Combat Developments Experimentation Command at Hunter Liggett Military Reservation, Jolon, CA. Although these aviators possessed a great deal of experience, they had to develop their own techniques and procedures. Extensive training was conducted at altitudes above 500 feet which allowed the individual to develop confidence in himself before conducting missions at NOE altitudes.

As the training progressed these aviators began to realize that man does possess the capability to perform missions at low altitudes even during the darkest night. Although man's vision at night cannot compare with that of an owl, they began to develop techniques which would overcome their night vision limitations (see "Aeromedic," June 1970 DIGEST). No longer was the term "groping in the dark" applicable to these aviators, for they had attained a degree of proficiency which qualified them to navigate over unfamiliar terrain during conditions at low illumination at altitudes from 50 to 125 feet above terrain obstacles.

How is it that these few aviators have achieved success in conducting low level operations while others hesitate to participate in such a frightening experience? Basically, they have learned that they are not as helpless in the dark as they thought. They have attained flight proficiency in their new night environment by applying certain techniques and procedures which weren't applicable during the day.

Most aviators possess 20/20 vision and never experience any difficulty in seeing terrain features during the day. Have you ever considered what flying 50 feet above the trees on a dark night would be like? How much could an aviator with 20/20 vision see? This question would have to be answered by the individual aviator, for the technique that he employs determines how much he will see. An aviator who is not familiar with the limitations of night vision will probably see very little.

In order to perceive the terrain features which must be identified with the naked eye, the Army aviator must learn to use his night vision capability.

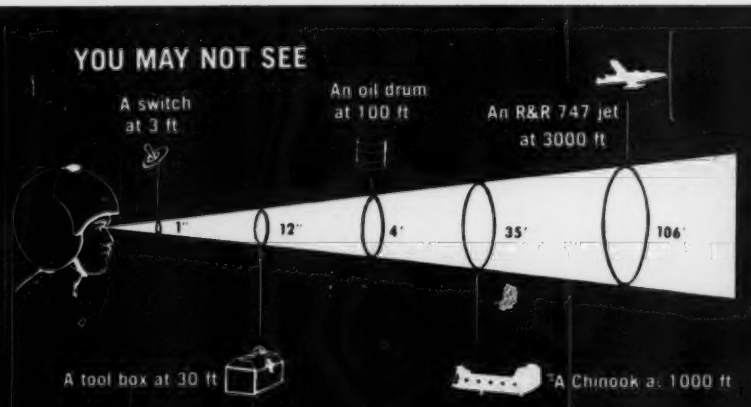


Figure 2

As a result of the projected central night blind spot, larger and larger targets will be missed with increasing distance

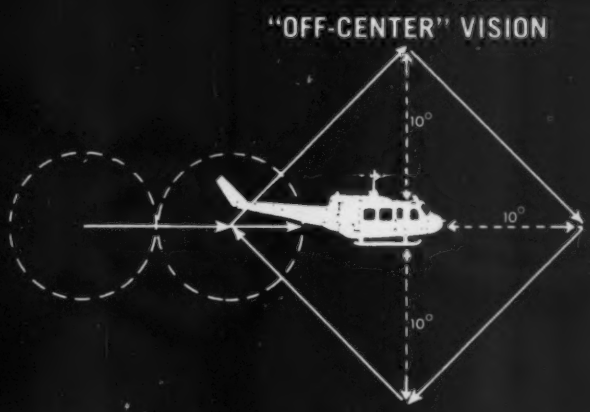


Figure 3

Once a target is detected in the peripheral field of dark adapted vision, continued surveillance is maintained by use of "off-center vision"... looking 10 degrees right or left and above and below the target, viewing no longer than 2 to 3 seconds at each position

As mentioned, man doesn't possess the night vision capabilities of an owl but his eyes are made up of certain nerve cells (rods) that allow him to see in the darkness. To effectively use the rods, sufficient time must be allowed for the eyes to dark adapt. Normally, this process takes approximately 30 to 45 minutes. Unfortunately, the aviator's operational environment doesn't allow for flight in almost total darkness. As a result complete dark adaptation cannot be achieved, thus the aviator must perform his missions without the total use of his night vision capabilities.

To minimize the loss of night vision during flight, the aviator can take certain precautionary measures to preserve dark adaptation. A means by which this can be accomplished is to plan the routes of flights away from populated areas to avoid the lights of a city. When a light source is encountered while in flight, change the heading to avoid overflight and turn the head and eyes away from the light. When subjected to an unexpected light source such as flares, searchlights or lightning, night vision can be maintained by closing one eye.

In addition to factors affecting dark adaptation, aviators must be aware of the limitation of the eye and its capability to perceive images at night. Due to low light levels at night the cones, which are located in the center of the retina, cannot perceive images. As a result a central blind spot of 5 to 10 degrees exists for each eye (figure 1). Thus, when you look directly at an object it may not be seen (figure 2). To compensate for this limitation you must practice a technique referred to as "off-center vision." In other words you view an object by looking 10 degrees above, below or to the side rather than directly at the object (figure 3). This technique allows the field of vision of one eye to compensate for the blind spot of the other.

Even though off-center vision is practiced, if an object is viewed for a period of time in excess of 2 to 3 seconds the images tend to bleach out and become one solid contrast. As a result the object can no longer be seen, thus inducing a potentially unsafe operating condition. To overcome this limitation of

Continued on page 30

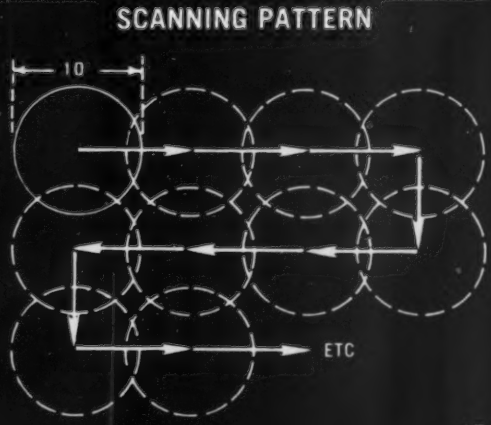


Figure 4

To scan effectively, look systematically from right to left and top to bottom at the field to be viewed, using 10 degree overlapping glances of 2 to 3 seconds each. Though it is the central visual axis that determines the scan, it is peripheral vision that detects and acquires anticipated targets

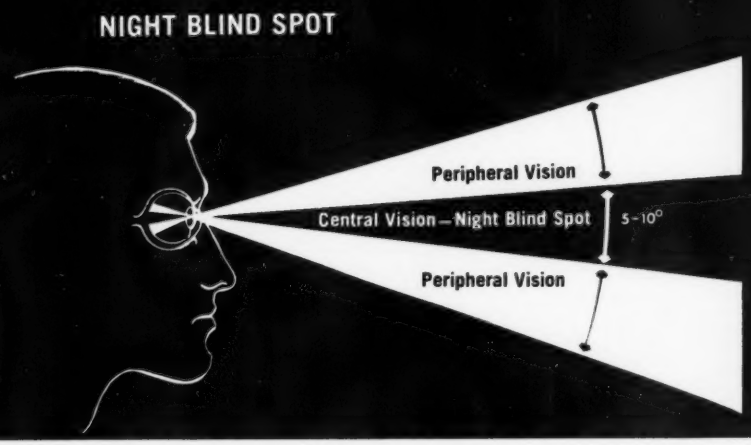


Figure 1

Since the cones of central vision are insensitive to low level illumination, a central night blind spot of 5 to 10 degrees projects from each eye into the field of vision

ticipated in tests relating to night NOE. You might say these aviators were the Christopher Columbus' of night NOE. These tests were conducted by the Combat Developments Experimentation Command at Hunter Liggett Military Reservation, Jolon, CA. Although these aviators possessed a great deal of experience, they had to develop their own techniques and procedures. Extensive training was conducted at altitudes above 500 feet which allowed the individual to develop confidence in himself before conducting missions at NOE altitudes.

As the training progressed these aviators began to realize that man does possess the capability to perform missions at low altitudes even during the darkest night. Although man's vision at night cannot compare with that of an owl, they began to develop techniques which would overcome their night vision limitations (see "Aeromedic," June 1970 DIGEST). No longer was the term "groping in the dark" applicable to these aviators, for they had attained a degree of proficiency which qualified them to navigate over unfamiliar terrain during conditions at low illumination at altitudes from 50 to 125 feet above terrain obstacles.

How is it that these few aviators have achieved success in conducting low level operations while others hesitate to participate in such a frightening experience? Basically, they have learned that they are not as helpless in the dark as they thought. They have attained flight proficiency in their new night environment by applying certain techniques and procedures which weren't applicable during the day.

Most aviators possess 20/20 vision and never experience any difficulty in seeing terrain features during the day. Have you ever considered what flying 50 feet above the trees on a dark night would be like? How much could an aviator with 20/20 vision see? This question would have to be answered by the individual aviator, for the technique that he employs determines how much he will see. An aviator who is not familiar with the limitations of night vision will probably see very little.

In order to perceive the terrain features which must be identified with the naked eye, the Army aviator must learn to use his night vision capability.

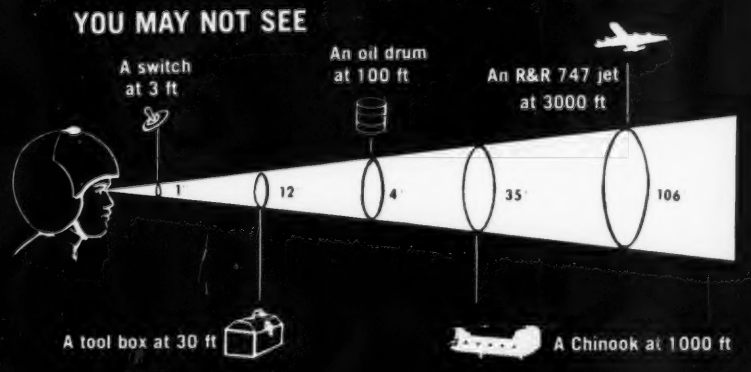


Figure 2

As a result of the projected central night blind spot, larger and larger targets will be missed with increasing distance

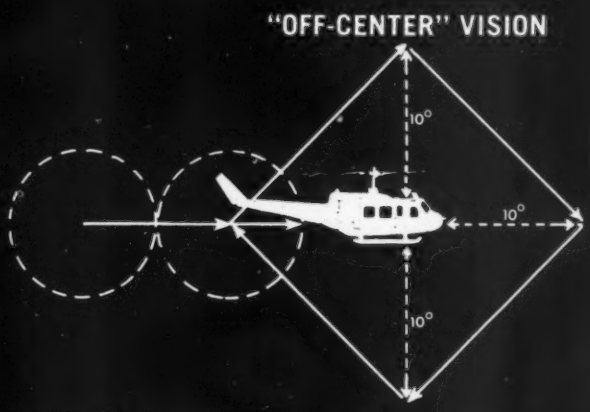


Figure 3

Once a target is detected in the peripheral field of dark adapted vision, continued surveillance is maintained by use of "off-center vision" . . . looking 10 degrees right or left and above and below the target, viewing no longer than 2 to 3 seconds at each position

As mentioned, man doesn't possess the night vision capabilities of an owl but his eyes are made up of certain nerve cells (rods) that allow him to see in the darkness. To effectively use the rods, sufficient time must be allowed for the eyes to dark adapt. Normally, this process takes approximately 30 to 45 minutes. Unfortunately, the aviator's operational environment doesn't allow for flight in almost total darkness. As a result complete dark adaptation cannot be achieved, thus the aviator must perform his missions without the total use of his night vision capabilities.

To minimize the loss of night vision during flight, the aviator can take certain precautionary measures to preserve dark adaptation. A means by which this can be accomplished is to plan the routes of flights away from populated areas to avoid the lights of a city. When a light source is encountered while in flight, change the heading to avoid overflight and turn the head and eyes away from the light. When subjected to an unexpected light source such as flares, searchlights or lightning, night vision can be maintained by closing one eye.

In addition to factors affecting dark adaptation, aviators must be aware of the limitation of the eye and its capability to perceive images at night. Due to low light levels at night the cones, which are located in the center of the retina, cannot perceive images. As a result a central blind spot of 5 to 10 degrees exists for each eye (figure 1). Thus, when you look directly at an object it may not be seen (figure 2). To compensate for this limitation you must practice a technique referred to as "off-center vision." In other words you view an object by looking 10 degrees above, below or to the side rather than directly at the object (figure 3). This technique allows the field of vision of one eye to compensate for the blind spot of the other.

Even though off-center vision is practiced, if an object is viewed for a period of time in excess of 2 to 3 seconds the images tend to bleach out and become one solid contrast. As a result the object can no longer be seen, thus inducing a potentially unsafe operating condition. To overcome this limitation of

Continued on page 30

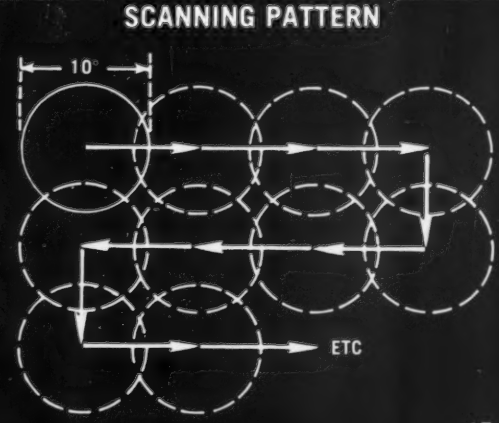


Figure 4

To scan effectively, look systematically from right to left and top to bottom at the field to be viewed, using 10 degree overlapping glances of 2 to 3 seconds each. Though it is the central visual axis that determines the scan, it is peripheral vision that detects and acquires anticipated targets

Getting That University Degree WITHOUT Formal Studies

Donald J. Nolan

Adapted from a speech made by Donald J. Nolan, Director of Regents External Degree Program, the State Educational Department, Albany, New York

GOING TO COLLEGE isn't the only way to get a college education. This statement is often heard and most people agree that it is true. But, in a society where diplomas are so important many qualified people, including those in the military, can't get ahead because they do not have college degrees. In response to this situation the University of the State of New York is awarding degrees to anyone who qualifies, without regard to age, place of residence or method of preparation. This route to a degree emphasizes that what a person knows is more important than how he learned it. This is known as the Regents External Degree Program.

As of 1 October 1973, 727 individuals—including 416 active duty military personnel—had earned associate in arts degrees (A. A.). They range in age from 19 to 63 and are from all walks of life—servicemen, homemakers, teachers, peace officers, nurses, managers, technicians, secretaries and sales clerks.

Of the military graduates, about 25 percent received degrees without formal college attendance. Instead, they earned their degrees through the College Level Examination Program (CLEP), United States Armed Forces Institute (USAFI), and Commission on Accreditation of Service Experience (CASE) guide evaluations. Thus, the Regents External Degree Program might be described as a new direction for education in the armed forces because it provides a focal point for all types of learning experiences. In addition to service schools, proficiency examinations and correspondence courses, other military graduates also acquired some regular college work to earn their degrees. So far 30 percent of all the credit earned toward the A. A. degree has resulted from nontraditional study, thanks in large part to the CLEP general examinations and the USAFI testing program.

The Regents External Degree Program was originated in 1960 when the College Proficiency Examinations (CPEs) were established. At that time, tests were prepared to enable qualified individuals to earn college credit or other educational advantages, whether or not they attended college classes.

Most popular have been the examinations in the nursing sciences, foreign languages, teacher education, the liberal arts and sciences, and accounting. Grading norms or standards for the nonresidents are determined by administering the tests first to a sample of regular college classes. Study guides and reading lists are available free of charge to assist candidates as they study on their own. The Regents External Degree idea builds upon the principles and experiences of the College Proficiency Examination Program, especially in its use of faculty, its reliance upon examinations that are first administered to college students to make sure they are appropriate and its maintenance of high standards.

Professors, administrators, business and civic leaders, together with higher education and testing specialists of the New York State Education Department, currently are working on these other external degrees: an associate in arts; an associate in applied science in nursing; a bachelor of science in business administration; and a general baccalaureate degree. While each degree program is different, there are some common elements. For example, there are no admissions or residence requirements; there is no age limit; the method of preparation is not prescribed; general education requirements can be satisfied by passing courses at accredited colleges; and classroom attendance is not required.

The Regents offer no instructional program. But, detailed examination descriptions and rather

extensive bibliographies and suggested study guides are available to assist degree candidates who elect to study on their own.

The associate in arts external degree requires 60 credits, 48 in the arts and sciences and 12 in free electives, which may be chosen from all fields of collegiate study, including vocational and technical subjects. National tests like CLEP or advanced placement examinations also may be used to earn credit toward the associate degree. Study through USAFI and military service schools is evaluated in accordance with the recommendations of the Commission on Accreditation of Service Experiences of the American Council on Education—the CASE guide. The next edition of the guide is to include evaluations of many additional technical courses.

Eventually students also may earn credit toward the associate in arts degree through special oral, written or performance examinations, if existing proficiency tests are not appropriate. In these instances faculty panels will be convened to evaluate the degree candidate. This special approach will be used to assess artistic, literary and musical accomplishments, as well as knowledge or skills gained on the job. No credit will be given for "life experience" whether in government, industry, military or civilian jobs. But every reasonable attempt will be made to give credit for college-level knowledge however it has been acquired. To earn such credit the candidate must be able to demonstrate his knowledge of skills through a relevant examination form provided by this special approach.

The baccalaureate degree in business has both a general education and a business component. Three levels of examinations covering the fields of accounting, finance, management and marketing are to be ready by 1974. Candidates for the business degree will be required to demonstrate basic competence in each of these areas of study and specialize in one. As the tests are developed they are being evaluated after administration to graduating seniors from New York and New Jersey schools of business.

The Regents B.A. degree is now in the formulative stage. Plans are to:

- include "majors" in most traditional fields as well as in the field of general or liberal studies;
- make use of all available tests (CLEP, CPEs, Undergraduate Program Field Tests, Graduate Record Examinations, American College Testing Program, USAFI, CASE guide evaluations, and Modern Language Associations' Advanced Language Tests);
- allow college credits earned at a variety of institutions and appropriately distributed to satisfy degree requirements; and
- use the "special assessment" technique for all parts of the program and especially to provide for capstone tests in a major field.

Of the programs under development only the associate in arts program has graduated students among whom 416 are on active military duty. They earned their credit by passing proficiency examinations, especially CLEP tests, and by submitting transcripts from accredited colleges and universities, from USAFI and through CASE guide evaluations.

Many of these have already resumed their education as third year students at colleges and universities. Others have decided to pursue the Regents External Degree in business for which they will prepare by taking some courses on campus, and some through home study. Many will use their veteran's educational benefits to finance these unique programs of study because the Regents External Degree is approved for that purpose.

There are several modest fees to cover partially at least, the administrative costs of the program. In addition to a $50.00 enrollment charge, students are required to pay an annual records fee of $25.00 and a diploma fee of $10.00. The average cost of each test is $25.00, but many students will take examinations offered by other agencies or study at colleges where they must pay regular tuition fees. If, however, a student completes the associate in arts program by proficiency examinations over a 4-year period he will pay a total of approximately $400. This figure does not include the cost of any instructional materials, books, help from tutors or formal college study.

How does the program work for military personnel? After examining the program literature, in particular the published degree requirements, and discussing these with his local education center counselor or educational advisor, the serviceman enrolls in the degree program of his choice. He coordinates with the advisor and arranges to have his official college transcripts, CLEP scores, USAFI reports and records of military schools successfully completed (DD Form 295) forwarded to New York for evaluation. All official records must come directly from the issuing agency, education center or college. A status report is then sent to the candidate by the university registrar. The majority of the military personnel initially enrolled had already met the requirements for the associate in arts

degree without additional study. At present, 3,600 people—including civilians—are enrolled in the associate of arts, business and nursing degrees.

Advising the student is a difficult issue to resolve in the external degree system. Military education specialists play an important role in counseling students; others are reached through conferences and work shops as was done in March 1973 when two members of the university staff visited more than a dozen military installations in Germany and England to explain the Regents program. Similar sessions are planned for posts in the United States. A new comprehensive catalog which should greatly facilitate written communications and assist counselors in evaluating students will be available shortly.

In order to earn either the business or nursing degrees, a candidate must pass a number of examinations which were formally available only at New York testing centers. In May 1973, education center officers administered tests to service personnel at bases in California, the District of Columbia, Massachusetts, North Carolina, Ohio and also in England and Liberia. Consideration is being given to make examinations available worldwide through the USAFI system on a regular basis.

A major objective of the New York Regents External Degree Program is to make higher education more accessible in the United States. The extent to which this objective is achieved in future years will be a measure of the program's success.

The Regents look to the day when this program will no longer be needed because teaching institutions everywhere will recognize and grant credit for learning, wherever it takes place.

GETTING STARTED

Continued from page 5

sponse of the team aviators.

Figure 2 represents the responses received when the team was asked about operations over mountainous terrain. Based on this information we determined that a well trained AHT consisting of a scout and two attack helicopters could routinely operate over a variety of terrain at altitudes varying from 10 to 200 feet AGL, dependent on the ambient light level. During the course of these tests we used AH-1G, OH-58 and some UH-1M aircraft.

Initially, the only modification to the aircraft was the installation of a radar altimeter. As we became more sensitive to the night environment, we further modified the aircraft through—

• Installation of tactile [touch sensitive] knobs on essential in-flight switches.

• Ballast added to simulate armament to improve center of gravity.

• Modified internal and external aircraft lighting.

A typical training day for the "Owl Team" began with a daylight preflight inspection of the aircraft. These preflights were abnormally thorough, almost to the point of performing an aircraft technical inspection. We knew that the major portion of the flight would be conducted at minimum altitude at reduced air speed, placing the aircraft in the deadman's zone of the height-velocity curve over terrain unsuitable for emergency landings. Much of the flight would be conducted in narrow canyons below the surrounding treetop levels.

Upon completion of preflight and runup checks, we reported for the mission briefing. A five paragraph field order prepared and issued by a member of the team was used. The navigation route would have been reconned earlier in the day by controller personnel to identify location of wire hazards. Following the briefing the crews would study and plot the route to be flown. Normally this planning required 1 hour.

Nightly assignments designated the crews for each aircraft. We found that the conduct of night low altitude flying requires a definite division of duties between the pilot and copilot/gunner with a great deal of intercockpit coordination. For example, the pilot—

• Ensures that the aircraft is mission ready to include a clean canopy.

• Handles all radio communication.

• Is responsible for terrain avoidance.

• Must maintain air speed and altitude as directed by the copilot/gunner who does the navigating.

• Informs the copilot/gunner of visual cues as required.

The copilot/gunner—

• Receives briefing and plans plots and verifies the route to be flown.

• Briefs pilot on the route.

• Advises pilot of approaching terrain, terrain clearance altitudes, wire locations and available forced landing areas.

• Is responsible for position keeping at all times.

• Must, above all, not hesitate to report to the pilot if he becomes disoriented.

Figure 3 illustrates a typical flight route. Start points, air control points, release points and the actual intended flight path are shown. To ensure adequate crash rescue support, we had ground rescue units prepositioned at specified locations along the flight route. Additional crash rescue was provided by stationing a rapid reaction, specially equipped UH-1H with a trained crew at the heliport.

The route was flown by one scout and two attack helicopters using a staggered trail formation with about 10 seconds between aircraft. The two AH-1G Huey-Cobras were not simply following the leader; each aircraft was prepared to take the "lead" and complete the mission at any point in the flight. A fourth aircraft manned by control personnel maintained a position well above the flight route to provide additional safety and administrative radio relay.

Sudden and unexpected changes in elevation during NOE flight had to be anticipated. With the navigation expertise developed by the "Owls," they were capable of predicting this situation even though forward visibility was sometimes limited to about 75 meters. Through comprehensive map study the crews knew exactly what they were approaching. The air control points were precisely reported as the aircraft passed over them. The copilot/gunner was able to report his position within 100 meters at any time between air control points.

In the tactical scenario played during this training we divided the battle area into brigade, battalion and company areas. During conduct of the flight we were required to establish communication with each echelon of command as we progressed into each commander's area. Continuous clearance was obtained from friendly air defense artillery. This requirement for continuous and simultaneous communication greatly increased the crews' workloads.

We made landings at a simulated forward area rearm and refuel point in the brigade area. These landings were made without the use of landing lights to a blacked out landing zone. Due to the restrictive line of sight communication capability, the scout was generally required to remain airborne to maintain contact with ground elements. Should the scout be directed forward to the forward edge of the battle area (FEBA) for a reconnaissance mission, at least one of the attack helicopters had to be airborne to avoid losing contact with the scout. At these low altitudes it was not uncommon to lose communication at very short distances.

Additional landings in nondesignated holding areas were sometimes required by the attack helicopters for fuel conservation or while awaiting missions from the airborne scout. When the missions were received, the attack helicopters proceeded to predetermined firing positions. There they entered and remained masked until given simulated target location information. We employed various types of illumination to light the threat side of the FEBA. Flash simulators were used along the route and forward of the FEBA to add realism to the training.

The dazzle effect on the unaided eye was detrimental to night vision, but thanks to training did not seriously degrade the crews' capabilities to complete their missions. We found that a night acquisition system is required to detect, recognize and engage targets at standoff ranges.

After each mission the "Owl Team" would meet with controllers and debrief the flight in detail. The sessions were recorded and provided the majority of input for implementation into the training program. These sessions were informal and designed for maximum participation. Constructive criticisms for the flight to include individual performance, aircraft deficiencies and training program shortcomings were solicited.

After having completed this training program, we feel that we have shown that there is a significant capability for the existing man/machine system. Through an intensive, directed training program and minor modifications to existing aircraft, we developed the capability to safely conduct night low altitude tactical operations.

Again, it should be pointed out that this was an exploratory program and, although "standard" Army aviators participated, this does not imply that this capability exists within operational aviation units. Those who would use these findings are cautioned and should realize that to attain these capabilities they must use deliberate, step-by-step procedures and be willing to dedicate personnel and equipment to assure the safe progression to the established baselines.

During the training program and ensuing side experiments, we flew a total of 1,800 night low altitude accident-free flying hours. We attribute this record and our success to the outstanding field support we were given and the timely and realistic guidance and leadership provided.

NIGHT BIBLIOGRAPHY

The bibliography which follows contains information about those stories previously published in the DIGEST related to night flight operations. The issue of November 1967 was devoted entirely to night operations. These articles are not discussed here. However, the DIGEST has a considerable number of surplus copies of the November 1967 issue on hand and will be glad to make them available upon request.

For the convenience of readers interested in a specific story listed in this bibliography, the DIGEST will forward the issue if available or a copy of the article. Please indicate the article by the number used below or by its full title and publication date and address your letter or card to—

Editor
U. S. ARMY AVIATION DIGEST
P. O. Drawer P
Ft. Rucker, AL 36360

1. April 1955 (page 9)
"Battlefield Illumination," Captain John B. Kusewitt, Jr.

Use of L-20s and L-19s for illumination in Korean War when most needed. Advantages of aircraft and aircraft flares over other forms of illumination.

2. May 1955 (page 21)
"Army Aviation in the Dark," Captain Weyman S. Carver

Nine volunteer pilots and observers fly 243 combat missions at night, (Korea) January to April 1953, and prove the value of light Army aircraft in bridging the gap between the Infantryman in the foxhole and the high performance aircraft of the Air Force.

3. May 1955 (page 25)
"H-13 Flight by Night," Owen Q. Niehaus

Pilot techniques to employ for night helicopter flight. Local area operation tips. Sensations that will be experienced by the novice.

4. July 1955 (page 13)
"Night Photography," Captain John Kusewitt

Advantages of night photo missions by Army aircraft—timeliness for lower echelon commanders; low altitude flight avoids radar detection yet provides detailed information for immediate estimate of situation.

5. September 1956 (page 5)
"Night Vision," Lieutenant Colonel Rollie M. Harrison

Dark adaptation slowly acquired, quickly lost in presence of light; blind spot—need to look indirectly at object; effects of hypoxia, fatigue, age, smoking and drugs on night vision.

6. May 1958 (page 20)
"Flight Surgeon"

Explains process of sight; pointers for night flying; rules for night operation by University of Southern California.

7. April 1959 (page 24)
"Night Flying Hints for the Sioux," Captain Wilford A. Baugh, Jr.

Fixation vertigo at night, hovering general and in Sioux, approaches, autorotations and forced landings.

8. January 1960 (page 1)
"Night Vision," CWO Clarence W. Tuxbury

Explains eye nerve ends, how to keep eyes dark adapted, proper eye movements, need to have clean windshield, good physical condition and oxygen above 5,000 feet.

9. January 1966 (page 26)
"Searchlight for Helicopters," Colonel Ben F. Hardaway, USAF

Light source "lightning bug" developed using seven C-123 landing lights suitable for UH-1B without additional auxiliary power unit. Proves value for nighttime reconnaissance, area search and as a new dimension to counterinsurgency at night.

10. April 1966 (page 2)
"Assault Helicopter Company and Night Tactical Operations," Captain Robert L. Oliver

Low level flight mandatory to escape radar detection, night formation lights, types of formation, protection and feasibility of night tactical helicopter operations.

11. January 1967 (page 35)
"Playboys and the Lightning Bug," Major William W. Fraker

How this searchlight was employed by the unit successfully against river traffic resupplying the Viet Cong and how it denied freedom of night operations to the enemy.

12. May 1968 (page 26)
"Night Airmobile Assaults," Major Vernon C. Grigg, Jr.

Problems and solutions for night formation, navigation, weather requirements, training, planning the mission, various means of illumination for advantage, night airmobile assault can reduce the mobility differential of the enemy and ensure our own element of surprise.

NIGHT BIBLIOGRAPHY

13. August 1968 (page 20)
"Night Tactical Approaches and Formation Flying," CW2 Barry R. Billman

How available lighting of the landing zone should be established, communication with the ground to ensure identity of landing area, use of aircraft lights. Formation requirements and techniques while taking off, en route and landing in tactical environment.

14. September 1968 (page 8)
"Fatigue and Night Flying," Major Ira L. Hartwell

The aviator's mental alertness is critically reduced after flying the Old Man to numerous sites. The pilot has had only 3 hours sleep in 2 days, has flown more than 12 hours half of it at night and it is 0245; an inoperative homer in "Old Sioux" and some distractions bring about disorientation.

15. September 1968 (page 28)
"Let's Highlight Night Flight," Captain Frank Gall

Thorough preflight, normal and emergency procedures, pilot-copilot teamwork and proficiency. All are even more important in darkness and determine the success of night flights.

16. October 1968 (page 18)
"Mohawk Infrared Mission," Major Donald I. Bernstien

Sequence of events for infrared mission, blackout takeoff to mission debriefings. Crews fly night both IFR and VFR covering all suspected targets in the corps area. Description of OV-1 mission aircraft and equipment for IR aerial surveillance.

17. October 1968 (page 27)
"Night Thievery," Major Howard J. Stiles

Night combat assault mission. Insertion of pathfinders, troop delivery and extraction of pathfinders without a hitch in the operation. The fruits of precision teamwork in combat.

18. January 1969 (page 48)
"Visibility Zero"

Reconnaissance mission—airborne at 2400 and again at 0130 after refueling, weather deteriorates. The two UH-1Cs and a UH-1D decide to return and land. They enter severe turbulence; the night is extremely dark and visibility zero. One aircraft is destroyed.

19. February 1969 (page 14)
"Firefly Tactics and the Cardinal Rules," Captain Glenn A. Smith II

Mission profiles for armed helicopter search and attack operations. Determined can't stereotype—must change with enemy's tactics. Rules that evolved to 1966. Preference for armed light ship to continue attack when others have expended ammunition.

20. March 1969 (page 15)
"Dual Controls for Night Flying," CW2 Roy A. Johnsen

Requirement for dual light controls for landing particularly in student training since IP frequently has to reach across the pedestal (in UH-1) to turn on or reposition lights. Exposes him to situation that may exceed capability to recover.

21. April 1969 (page 40)
"Night Thunderstorm Vertigo"

Both the AC and pilot of a UH-1D experience vertigo. The entire crew of four and five aviator passengers survive the helicopter crash and give their account of the final minutes of flight in blinding lightning.

22. May 1969 (page 6)
"Reconnaissance Patrol," Captain R. J. Ronchetti

The mission begins according to plan: insert a six-man reconnaissance patrol at last light but the patrol within minutes requests immediate evacuation. Darkness, weather, increasing enemy automatic weapons fire and two gunships with only 20 minutes fuel left when the last man is extracted add to the stressful situation.

23. May 1969 (page 16)
"Night Hunter Operations," Captain Richard C. Keehn

In November 1968 this concept was first used against the enemy in the Mekong Delta. Task force includes a mobile radar set, an air cavalry element, roving waterborne patrols, infantry ambush sites and supporting artillery. Tactical flight operations are cited with reasons for specific procedures employed.

24. June 1969 (page 2)
"Combat Night Air Assault," Colonel Kenneth D. Mertel

First night combat air assault into enemy held landing zone under fire by "A" Company of 1st Bn, Abn 8th Cav. The article describes the Battle of Ia Drang on 3-4 November 1965 and Operation Lincoln (the second such assault) on 30 March 1966. Emphasizes importance of the "little things" in night operation—the need for detailed planning.

NIGHT BIBLIOGRAPHY

25. November 1969 (page 23)
"Nighthawk," Captain Garrett C. Marcinkowski and CW2 Steven J. Zorger

Phenomenal success of the UH-1H with xenon searchlight and a night observation device. Aircraft in this configuration with a minigun (1500 rounds per minute) and three gunners with M-60 machineguns prowl the skies individually in specific areas on search and destroy missions. Light has both infrared and white light modes.

26. November 1969 (page 30)
"The Tiger's Roar," Captain William E. Walgren

Assault helicopters alerted at 0330 hours to repulse the enemy about to overrun an outpost in Chau Doc sector. Flight of three UH-1Bs and an AC-47 flareship repel the attack. XM-3 rocket ship has devastating effect. The 40 minute operation accounts for over 100 enemy dead.

27. December 1969 (page 7)
"Exercise In Visual Purple," Captain Clark D. Hein

O-1 Bird Dogs airborne at last light on mortar watch missions to detect first signs of enemy attack, conduct artillery fire missions at night and support special combat operations which are widely varied. O-1 often only link between ground element and its headquarters.

28. January 1970 (page 2)
"Triple Nickel Winks at the World," Captain Anton J. Skarich

Emergency resupply mission at night into mountainous jungle terrain, unauthorized application of masking tape covering Triple Nickel's landing light and new copilot's first flight with the unit combine to surprise and needlessly endanger the crew.

29. February 1970 (page 25)
"Night LRRP Extraction," Captain Robert C. Lentz

Tactics for inserting a long range reconnaissance patrol (LRRP) team. The team is engaged by a well organized enemy unit within minutes and requests extraction. During the pickup both escorting Cobras' guns jam and the pickup UH-1 takes a nose hit. On reaching 1,000 feet the engine fails.

30. April 1970 (page 10)
"Night Vertigo," Captain Terry P. Gardner

Combat assault aviation unit and infantry division units develop into a well coordinated team with such high regard and mutual respect for each other that they give that little extra to help the other guy. Elect to cover for infantry though low on fuel. Weather closes in and pilots experience vertigo.

31. November 1970 (page 1)
"Tactics," Major Jim H. Clary

1968, Vietnam, the Viet Cong (VC) launch a multibattalion attack beginning at 2200 hours. How Army aviators successfully developed and employed a scheme of fire and maneuver when artillery was unavailable and air strikes were not always possible. At 0500 the VC withdrew due to the grazing fires of the gunships.

32. May 1972 (page 10)
"Mission: Personal or Professional," Captain Rudi Hamvai Jr.

Four Navy river patrol boats are ambushed. Proud of a strong sense of mission accomplishment and a burning desire to help their embattled comrades, a light fire team and their secondary team (five UH-1Cs) are scrambled at 0200 hours and remain on station too long. Weather engulfs even the low ship at 200 feet.

33. September 1972 (page 2)
"Mission: Nightmare," Captain Steven D. Vermillion

Their primary mission was to rescue the injured and the crew felt they couldn't turn this one down without making an attempt. Called at night, the crew attempts a landing atop Giah Key Mountain to rescue two mortarmen who suffered amputations when a round exploded in the tube.

34. November 1972 (page 12)
"The Black Minute," Captain Claude T. Stanley

An assault helicopter company prepares for a practice night airmobile assault mission. All aircraft that meet full night flight requirements are cranked and standing by at 2015. The routine practice expected turns out to be the real thing as the C&C aircraft relays that an outpost near the LZ has been attacked by the Viet Cong.

35. May 1973 (page 2)
"Helicopter Low Level Night Operations," Lieutenant Colonel George W. Moses

Night flying capability may be dramatically enhanced by recent successes in research and development. Night vision goggles are one of the approaches tested to permit night nap-of-the-earth flights. Aircraft modifications desirable and data on 700 hours of successful flight testing are revealed.

36. June 1973 (page 6)
"The 'Eyes' Have It," Captain Edward I. Carroll

Just after dusk the scramble horn sounds and the UH-1 is airborne in less than a minute. At the pickup zone the gunships finish prepping the area and the recovery Huey descends. On short final, the tail rotor is hit and a crash landing follows. Value of the helmet visor.

37. November 1973 (page 4)
"The Cav's STAR," CW2 Charles M. Tidey

The STAR (Surveillance, Target Acquisition and Reconnaissance) Platoon is representative of new looks and tactics in Army aviation. Tests during hours of darkness at nap-of-the-earth to avoid radar detection.

The Army Test Pilot

Continued from page 9

calendar time because of delays due to maintenance, instrumentation and higher priority projects and there have been tests which have required many more people to perform and support the test.

No discussion of recent USAASTA test programs would be complete without mentioning the attack helicopter requirements evaluation which took place in the spring of 1972 at contractor facilities and at high altitude test sites. This evaluation required flight tests of the Bell Model 309 KingCobra, the Lockheed AH-56A Cheyenne and the S-67 Sikorsky Blackhawk, and took nearly all the resources of USAASTA to accomplish. Other USAASTA programs have included tests of new tail rotors for the AH-1G and OH-6A, heavyweight autorotation tests of the AH-1G, vibration and temperature surveys of all the firstline Army helicopters and evaluation of flight director systems in the OH-6A and OH-58A. In addition, an evaluation of the Canadair CL-215 amphibious airplane was made for the U.S. Forest Service in 1972 to assess its suitability for the air tanker mission. There also have been inflight icing tests which are still in progress. The basic purpose of these tests is to determine the capability of Army helicopters to operate in icing conditions. The airworthiness qualification of the CH-47C installed icing spray system which was developed for those tests was also accomplished by USAASTA.

From these few examples one can see that a test pilot can expect to be involved in a wide variety of tasks. This should give a good insight into what an engineering test pilot does. What are some of the personal challenges that face a test pilot?

First, he must be able to achieve the proper mix between inquisitiveness and discipline in his work. He needs to have the desire to get at the reason an aircraft or piece of equipment behaves the way that he has observed, but this inquisitiveness must be tempered with discipline. His inquisitiveness or other motivations must not lead him to deviate from his planned tests unless he and other members of the test team are sure that it is logical and safe to make that deviation. The equipment that is being tested may be a prototype item; it will probably be expensive and the test program cannot be placed in jeopardy because of delays due to damaged or destroyed equipment caused by test pilot actions which were not adequately planned. But, the test pilot also must be adaptable to changing situations. In spite of what may appear to be a conflict with the discussion just finished, he must be prepared to deviate from his primary tests when conditions such as weather or instrumentation failures dictate. The difference is that this deviation is preplanned. Flying time and calendar time are both critical so maximum benefit must be gained from the time available.

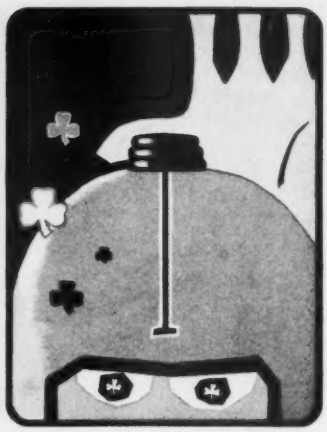
Next, he must continually develop greater technical competence to do the job. That is done by building, with experience and further study, upon the foundation that is laid in the test pilot school. The test pilot is challenged by a great deal of responsibility in his daily work. Besides the responsibility for obtaining valid test data, he has ultimate responsibility for flight safety in a test program. When there is any doubt, the test pilot always makes the final decision as to whether a portion of a particular test can be conducted safely. Beyond the requirements of his own job the test pilot will frequently be the project officer and as such will be responsible for the work of the entire test team. In either case much of the work he does is not under close scrutiny of his supervisor. Therefore, the supervisor must have confidence in the test pilot's ability and willingness to get the job done correctly and on time.

Finally, there is constant challenging of the test pilot's integrity. Important decisions are based on the results of his tests, therefore, what the test pilot reports must be correct. He cannot attempt to pass off bad data for good just to avoid doing certain tests over admitting that he erred in some way. Because the test pilot is nearly always evaluating something a contractor is trying to sell to the Government, he must approach each test with impartiality. His dealings with contractors must be business-like and impartial so there can be no question as to his conduct and no actions which could be interpreted as a conflict of interest.

Of course, there are other personal challenges that a test pilot must face but I believe the ones I have mentioned convey the impression I want to make.

Being a test pilot today is an opportunity for you to take a step which will certainly influence your career in Army aviation. Prerequisites for and additional details concerning the Army Aviation Engineering and Flight Testing Program will be published, perhaps in an Army regulation, sometime in the spring. In the past that information has been in a DA circular. Although there is no current circular, the latest one was DA Circular 351-28, dated 16 August 1971. It may still be used as a guide for applying.

VIEWS FROM READERS



Sir:

During the period of June 1972 to May 1973, I served as project and safety officer of the 155th Aviation Company (Attack Helicopter) "Owl Team." Our sole purpose for existence in the beginning was to develop a training program that would prepare aviators to participate in CDEC Experiment 43.7 entitled "The Attack Helicopter in the Clear Night Defense." Not really knowing how to begin we researched Army-wide for background info and found not only an almost total lack of data but also a general feeling of disdain for night operations. Putting our own fears at least partially aside, we began. What resulted is documented in the CDEC Final Report for Phase I, 43.7 and encapsulated in the inclosed article [see article beginning on page 3].

What we established was an unaided eye baseline defining operating altitudes for standard Army aircraft, with only minor modifications flown by well trained "standard" Army aviators.

We recently trained three aviators from Ft. Rucker, AL, who will be the cornerstones for specialized night training to be conducted at the U. S. Army Aviation Center at Ft. Rucker.

During the training program we made numerous discoveries that are being written about by other members of the "Owl Team" and will be submitted shortly for your edification. . . .

CW2 Ralph S. Park
Safety Officer
155th Avn Co (AH)
Ft. Ord, CA 93941

Sir:

Could you please inform me why the Army thinks when you have 1500 hours flight time and are commissioned that you are not to fly? To me this is an injustice to professional aviators who are commissioned. I, for one, have over 2500 hours which I got in less than 5 years because I wanted to fly.

I now sit behind a desk doing a branch job in a Field Artillery unit, of which I have had a total of 4 months training and no experience. On the other hand, I have 5 years experience in aviation and my MOS could just as well be used in an aviation battalion.

Why is the warant officer the only one that the Army feels is the only professional pilot? I'll put my knowledge and skill up with the best of the warrants and probably come out ahead.

I would like to get back into some form of aviation. I was enlisted and wanted to fly, so I went to flight school. Now, after 5 years the Army has chosen for me by branch a ground job. O.K., but why not in aviation where I have a great deal of experience instead of a Field Artillery unit?

I draw flight pay, but to heck with the money. I want to do what I have worked 5 years to become, a professional aviator. I would fly even if they did not pay flight pay.

I know for a fact that there are plenty of pilots, not aviators, who do not want to fly but most of these have less than 1500 hours and are flying mainly just for the flight pay. Surely these people cannot be considered "professional pilots" when they have no desire to fly or perform their duties properly. I suggest a one for one exchange with these type individuals and they can have my flight pay if that is the reason they are flying.

I just advised a young EM the other day to go to OCS and then flight school. He came back to me and said that flight school was closed. He will get commissioned and probably not flight school. I have tried to get fixed wing training, but to no avail. I have a CFI in both fixed wing and rotor craft, instrument, multiengine and commercial license in both types of aircraft.

It now appears that the only ones the Army wants to fly are the warrants. O.K., who will take charge of company battalion and brigade when the U. S. Army is in need of the Army aviation again, like in the Republic of Vietnam. It will not be the warrants, but young officers who are commissioned like myself, after the Army sees the need for us in aviation.

The Army makes the rules and I must live with them to stay in the Army. But may I ask, why can't I sit behind a desk in an aviation company around what I know and like best, and not around an 8-inch howitzer?

I think highly of the warrant aviator and feel that the flight pay should be equal, but I feel that aviation to the commissioned and warrant pilot should be the same also.

A grounded aviator,
CPT Vaughan M. Smithwick
1st Battalion, 36th FA
APO New York 09178

• The DIGEST forwarded CPT Smithwick's letter to the Director of Army Aviation. His personal reply to the Captain follows:

Dear Vaughan:

Your letter of 15 October 1973 to the editor, U.S. ARMY AVIATION DIGEST has been referred to my office for reply. I have elected to personally respond because I understand and appreciate your point of view and consider your questions to be valid and important.

Vaughan, some 15 plus years ago as a lieutenant, I had the same desire to "get in the air" that you do. Fortunately, a wise colonel provided me with some very sound advice. He said "Lieutenant, the Army has no place for a commissioned officer who only wants to fly. The only fulltime aviator in the Army is the warrant officer. We do not have a separate branch and do not propose to form one. If you are to succeed as a commissioned officer in the Army you must be qualified in your branch as well as in aviation. You see, it is this combined qualification that makes Army aviation so worthwhile."

Fortunately for me I listened to that colonel and the wisdom of his words soon became apparent. It soon became obvious that only by being qualified in my branch could I really be fully qualified to lead any Army aviation unit.

The old colonel's philosophy states well the current Army position. In your case this means that you are a Signal Corps officer first and your qualification as an aviator is just an additional skill that you possess. The Signal Corps Branch provided you with your present assignment to assist in achieving basic branch qualification. While it is true that you could be performing as the Signal officer in an Aviation Battalion, your current assignment as the Signal officer in a Field Artillery Battalion will make you a better qualified officer. I urge you to dig in and make the most of your assignment, learn all you can about the ground soldier and your organization's tactics. "Charge in there" with a "can do" attitude like you have always been trained to do as an aviator and make all of the officers in your unit admire how well you can accomplish your current responsibilities. After doing so, watch how they look at your wings with admiration.

The remainder of my letter addresses your specific questions. As you will see, some of the things we are doing are not necessarily by choice but instead result from monetary considerations and the energy shortage.

In order to reduce expenditures for proficiency flying we are required by public law to establish a system that limits the number of proficiency aviators. As a result of this congressional action, and the Army's analysis of aviator requirements, we established 1500 military flying hours as the cut-off point for active participation by our aviators assigned in nonoperational flying positions.

The Army does not consider the warrant officer as the only professional aviator. We want all of our aviators, commissioned and warrant, to be professionals. The reason why warrant officers fly fulltime and commissioned aviators do not is a simple matter of requirements. For example, the commissioned aviator must be branch qualified and must fill numerous staff assignments. We do not need a large number of colonels, lieutenant colonels and majors to fill cockpit slots; however, we do need qualified aviators of these ranks to fill numerous other assignments.

Although I hope not, you are probably correct in your assertion that some of our commissioned aviators who have less than 1500 hours want to fly only for the pay. You offer to give them your pay if you could assume their flying responsibilities; however, I think you will understand that this would not be feasible in light of what I have said earlier about your Army responsibilities.

Your young enlisted friend was misinformed by whoever told him flight school was closed. We have cut back in our training, but have not closed the school—not by a long shot. I can, however, understand your problem in trying to get fixed wing training because we have reduced this to a minimum. Look around for Army fixed wing aircraft and you will see why.

In wrapping this up, let me again say that I can understand how you feel. Being with aviation and doing your thing as an aviator is fun. You will no doubt have the opportunity to again serve with an aviation unit. However, there is just one thing that I request that you keep in the back of your mind. As you progress into field grade rank most of your assignments will dictate that you be qualified in far more than pure flying skills. Don't blow the opportunity to prepare for that day and at the same time destroy the chances for success as a commissioned officer aviator.

You have my best wishes for your success.

James H. Merryman
Brigadier General, GS
Director of Army Aviation

Sir:

Recently, while flying an AH-1G the environmental control unit (ECU) malfunctioned to the full on cold position. We tried, unsuccessfully, to turn off the ECU through switches, circuit breakers, reostat and even cutting off all electrical power in the aircraft, but to no avail. After approximately 15 minutes of flight the cyclic began to stiffen in an ever closing circle. We made an immediate landing from our altitude of about 500 feet and by the time we got to the ground the cyclic was literally FROZEN SOLID. Had we been at a higher altitude who knows what would have happened.

This is the second time I've come across this problem. In Vietnam we had an aircraft with the same problem when the ECU was kept on in the cold position for too long a period. Also, while doing some cold weather work on the Cobra in 1970-71, the cyclic would be immovable during a cold start until the ECU had been operated in the "warm" position for a few minutes. At the time it was attributed to the hydraulics, but since these last two instances I feel it may be part of the same problem mentioned above.

What causes the problem? It seems to be in the area of the bellcrank on the bottom of the pilot's cyclic.

I was wondering if any information has been distributed on this or any action taken. I would suggest the following if redesign is not feasible:

1. Ground any Cobra in freezing weather that has a malfunctioning ECU.

2. If ECU comes on and stays on in the cold mode, land immediately or get down to a low enough altitude where an immediate landing may be accomplished.

CW2 E. Richard Ashton
Troop E (Air), 1st Cavalry
172d Arctic Light Infantry Bde
APO Seattle 98731

• The DIGEST received an official response to your letter . . . the answer comes in two parts: First, from the U. S. Army Aviation Systems Command (AVSCOM); and, second, from AVSCOM's coordination with Bell Helicopter Company. Copies of both appear below:

...We contacted Bell Helicopter Company regarding the ECU malfunction. Their response is attached [see below].

We are entering the content of Service Engineering Memo AH-12-73-1 (see No. 6, Incl 1) in the EIR Digest.

Since the above modification shall appear in the EIR Digest, the two suggestions in the letter received by the AVIATION DIGEST have been disapproved.

Thank you for the inquiry about the ECU. We appreciate the interest of CW2 Ashton in solving a problem he found with the AH-1G. If we can be of further assistance, please contact Jim Kirkwood, AUTOVON 698-6516.

Donald Macy
Chief, Attack Helicopter Branch
AVSCOM

The letter [above] stated the ECU on an AH-1G helicopter had malfunctioned to the full on cold position. After 15 minutes of flight the cyclic controls had stiffened to a point that they were immovable after touchdown.

The contractor's Engineering Department has reviewed the referenced letter and suspect the following condition may have transpired:

If the ECU flow control valve should malfunction, or if the ECU cuts off and the vent blower comes on along with the closing of the outlet valves, an increase of pressure in the duct system would occur. This condition would cause a swelling of the P/N 209-070-433 duct assembly exerting pressure against the cyclic control rod assembly.

AH-1G helicopters S/N 70-15936 and subsequent have valve assembly P/N 209-072-401-5 installed. This assembly has washers and spacers attached to eliminate expansion of the duct in the event of overpressurization. Reference TM 55-1520-221-35P, page 113, figure 228, items 52, 54.

AH-1G helicopters prior to S/N 70-15936 have duct assembly P/N 209-070-433-1 installed, which does not have the spacers and washers installed. Reference TM 55-1520-221-35P, page 1108, figure 237, item 45.

Service Engineering Memo AH-12-73-1 has been prepared and will be released to permit field modification to the 209-070-433-1 duct assembly.

The contractor feels that the final decisions regarding the conditions, as stated in items #1 and #2 of Mr. B. Richard Ashton's letter, should be made by the using activity.

BELL HELICOPTER COMPANY

Sir:

Your Views From Readers column [November 1973] concerning the history of the UTT [Utility Tactical Transport Helicopter Company] and 334th Aviation Company still appears to contain substantial errors of fact. Specifically, no mention is made of the 68th Aviation Company and 197th both of which I believe were successors to UTT before the unit was redesignated the 334th.

I did not serve with the unit; however, I was a gunship pilot in the 114th Aviation Company in 1965 and I know at that time the unit was the 197th and their pocket patch had an acknowledgment of the 68th being a predecessor. In point of historical accuracy you are doing the former Raiders, Playboys and Dragons who served with the unit while under the above designations a disservice. I believe that the statement in your comments on page 1, November 1973 issue, are grossly in error when you state personnel expertise and hardware went over to the 334th. To the 68th or 197th perhaps, but I believe these units passed on the above assets to the 334th.

Normally your magazine is considered a highly reliable source for many of us in Army aviation. For this reason I point out what I feel is an error of great magnitude.

Major Phillip V. Branstuder
Trp B, 1st Sqdn (Air), 17th Cav
82d Airborne Division
Ft. Bragg, NC 28307

• Past research and a limited inquiry spawned by receipt of your letter does not indicate that the DIGEST is in error. However, inquiries such as yours are what it takes to "nail down" our Army aviation history accurately. Thus, I am taking another comprehensive look into the matter. The attached letter will give you an idea of the approach [see letter below to the Office of the Chief of Military History].

Previous research indicates that any exchanges, formal or informal, would be between the UTT and the 334th. I am looking into this again, too.

I do not feel that the DIGEST has done a disservice to the 68th or 197th. On the contrary, the VFR is referring to an article that had stated (as you do) that the 68th and 197th were successors to the UTT before it was redesignated the 334th ["Armed Helicopters Around The World," September 1971]. Our references for this are probably the same as yours. However, this lineage is not accurate according to information received previously from DA. I am pursuing this point again in light of your comments.

Based on DA's information, and unofficial interviews, the DIGEST cannot be "grossly in error" by saying, ". . . the expertise and some of the personnel and hardware did go over to the 334th." But, let's see what our latest efforts turn up.

Thank you for citing the DIGEST as a highly reliable source of information . . . I strongly feel that one main reason it is can be traced to people such as yourself who take the time to call matters to our attention when they feel there is an error.

Editor

Below are excerpts of the DIGEST's query to the Office of the Chief of Military History in response to Major Branstuder's letter:

The Adjutant General's Office confirms that the 68th Aviation Company, the 197th Aviation Company and the 334th Aviation Company were TOE units. TAGO also states that these companies could not have a common lineage with the UTT because the UTT was a TDA outfit. However, TAGO did state that this was possible only if the Chief of Military History approved it. This brings me to the questions I need your help answering:

• Did the Chief of Military History make an exception to allow the UTT to have a common lineage with any (or all) of the mentioned companies (68th, 197th and the 334th)?

• Do the 68th, the 197th and the 334th have a consecutive, common lineage in this given sequence?

• What are the dates of deactivation or inactivation of the UTT; the 68th Aviation Company; the 197th Aviation Company; and the 334th Aviation Company?

Below is the reply from the Office of the Chief of Military History:

Under the provisions of paragraph 10-4d, AR 870-5, lineage and honors are determined only for TOE units which are flag, color or guidon bearing organizations. Since the Utility Tactical Transport Helicopter Company was a TDA organization no lineage and honors will be determined for it. The Chief of Military History has not made any exception to this policy with respect to the UTT and has not authorized "a common lineage" for UTT with any other

TOE organizations which have ever existed on the rolls of the U. S. Army.

The 68th, 197th and 334th Aviation Companies are separate and unrelated organizations with different histories. The 68th's lineage is as follows: constituted 7 March 1960 in the Regular Army; activated 14 April 1960 at Ft. Ord, CA, and inactivated there 6 December 1962; activated 15 August 1964 in the Pacific and inactivated there 1 March 1965; activated 5 July 1965 at Ft. Benning, GA, and inactivated there 20 March 1972. The 68th remains inactive. The 197th's lineage is as follows: constituted 16 February 1965 in the Regular Army; activated 1 March 1965 in Vietnam; and inactivated 24 June 1972 at Ft. Benning. The 197th also remains inactive. The 334th was constituted 10 November 1966 and concurrently activated in Vietnam. It has remained active and is presently stationed in Germany.

The limited personnel resources of this office preclude a search of microfilm records of the several thousand TDA organizations formed over the years in order to cite the inactivation date of the UTT. This inactivation date could be more readily determined by The Adjutant General's Office if the unit identification code (UIC) number for the UTT could be provided.

Some of your readers appear to be confused by the fact that some personnel originally assigned to UTT were reassigned to the 68th after that unit was activated 15 August 1964 in the Pacific, that some personnel assigned to the 68th were reassigned to the 197th when that unit was activated 1 March 1965 in Vietnam; and that still other personnel assigned to the 197th were reassigned to the 334th when the 197th was transferred 1 September 1966, less personnel and equipment, to Ft. Benning and when the 334th was activated 10 November 1966 in Vietnam. However, a transfer of personnel does not itself carry the history of one unit to another. A "Unit History Report" submitted to this office by the 197th Aviation Company in 1966 erroneously claims that the 197th was previously designated as the 68th Aviation Company. Such a redesignation never took place. The 68th, the 197th and the 334th have no lineal relationship whatsoever, and since TDA units such as the UTT do not accrue history, none of these three TOE companies is historically related to the UTT or to any other organization which has ever existed on the rolls of the U. S. Army.

In his letter to the editor published in your November (1973) issue, James D. Sprinkle quotes from a history of the 334th Aviation Company "published by the company on 25 March 1971." We have in our files annual historical supplements submitted to this office by the company for calendar years 1966, 1967, 1969 and 1970. All except that for 1969 refer to UTT with similar wording, and they are all equally erroneous when they refer to the UTT being redesignated as the 68th, to the 68th being redesignated as the 197th, and the 197th being redesignated as the 334th.

We also have in our files a photograph clipped from the 16 June 1965 issue of the Army Times announcing "the winning unit patch design" for the 197th, the same insignia to which Major Branstuder refers in his letter. The design shows Pegasus, the flying horse, with a "UTT" brand and the number "68." We have been advised by The Institute of Heraldry that they have no record of a "pocket patch" having ever been authorized for the 197th, or for the 68th or 334th either. Therefore, the wearing of such an insignia by personnel of the 197th does not establish any lineal relationship of that unit with either the UTT or the 68th Aviation Company. If your readers desire more information about the design or wear of cloth shoulder-sleeve insignia, metallic distinctive insignia or "pocket patches," they should write to the Director, The Institute of Heraldry, U. S. Army, 5010 Duke Street, Cameron Station, Alexandria, VA 22314.

Walter L. McMahon
Colonel, Infantry
Chief, Historical Services Division

INSTRUMENT CORNER

Q. I understand there has been a change in the regulation about operating under a "cruise" clearance. If there is a change would you please explain it and its effect on a flight cleared with a "cruise" clearance.

A. The Federal Aviation Administration Advisory Circular, Number 90-54A, dated 27 December 1973, states: "A 'cruise' clearance is an air traffic control clearance issued by air traffic controllers to pilots in order to reduce communication, workload, conserve fuel and afford the pilot with flexibility in his operation. Because questions have arisen as to controller application and pilot action/responsibility while operating on such clearances, the procedure has been rewritten." The amended procedure authorizes the pilot to climb and descend in a block of airspace but prohibits a climb back to the original altitude once the pilot starts descent and reports leaving an altitude in the block.

The following information will be included in the Airman's Information Manual and the air traffic control handbooks: "Cruise — A word used in an ATC clearance to authorize a pilot to conduct flight at any altitude from the MEA/MOCA up to and including the altitude specified in the clearance. The pilot may level off at any intermediary altitude within this block of airspace. Climb/descent within the block is to be made at the discretion of the pilot. Once the pilot starts descent and reports leaving an altitude in the block, he may not return to that altitude without additional ATC clearance."

Continued from page 17

night vision the aviator must be aware of the phenomena and avoid viewing an object "off-center" longer than 2 or 3 seconds per scan. By shifting the eyes from one "off-center" point to another, the object of regard will continue to be acquired in the peripheral field of vision.

The technique used by the aviator to view the terrain along the flight path becomes an important consideration if he is to perceive obstacles and identify terrain features which will ensure safety of flight, accurate navigation and target acquisition. To scan effectively the aviator must scan from right to left, top to bottom of the field of view in 10-degree overlapping movements (figure 4). While eye movements will be directed along the central visual axis, it is the peripheral field of vision that will permit detection of an object coming into the field of view. The scanning technique can be compared to a series of aerial photographs. The total of all the pictures would compose a "composite" of the terrain being viewed. Once the aviator has developed this scanning technique, he must incorporate one additional factor. This again involves the rate at which the aviator will scan.

Due to the inability of the cones to perceive images while in motion, the aviator must develop a stop-turn-stop-turn type motion. The time required in the stop portion of the scanning procedure is determined by the degree of detail that is required but should be no longer than 2 to 3 seconds. It is important that as the aviator scans his head and eyes are rotated parallel to each other. Viewing the object out of the corner of the eye further reduces visual acuity. (It should be remembered that head movements must be limited during turning maneuvers to avoid vestibular illusions such as Coriolis; see "Aeromedic," May 1972 DIGEST.)

Reference has been made to the fact that visual acuity is significantly reduced at night. This is illustrated by tests which show that an aviator who possesses 20/20 day vision can only see 20/200 at night. In order to compensate for this limitation, the aviator must develop other means of identifying features at night.

A technique which has proven to be effective is to identify objects by their silhouettes. A church building which normally is structured with high roofs and a steeple forms a silhouette that is easily recognizable during low light conditions. Farm buildings, bridges and irregular structures are other examples that an aviator may be required to identify by their silhouettes to assure positive correlation between map and terrain features.

The factors which have been discussed relate primarily to the physical limitations of night vision. There are other limitations to night vision which are self-imposed by the aviator. An awareness of these self-imposed restrictions are essential to ensure that each is avoided before participating in night flight. Smoking has the same effect on the body as hypoxia. It causes a loss of visual acuity, brightness, discrimination and dark adaptation. Smoking three cigarettes may cause a carbon monoxide saturation as high as 8 percent, with an effect of visual light sensitivity equal to that of an altitude in excess of 8,000 feet. As previously stated, the visual acuity of an aviator with 20/20 vision is reduced to 20/200 at night. The effects of smoking will further reduce this factor to the point that flight becomes a safety hazard.

Alcohol tends to create laziness. As a result the aviator fails to apply all night vision techniques and procedures. He begins to stare at objects, scanning techniques become disorganized and visual sensitivity is further reduced. The degree to which night vision is affected is determined by the amount of alcohol consumed. Even one drink can cause a measurable reduction in night vision ability.

Fatigue is another factor which affects night vision. As the degree of aviator fatigue increases, the aviator's night vision capability decreases. This is caused by the aviator's inability to apply proper scanning techniques. His physical limitations are very similar to the conditions associated with alcohol. The stress factors which are caused by night NOE flight creates more fatigue on the aviator than any other type of flight. To overcome this limitation the aviator must be physically fit. Active participation in a daily physical training program is necessary to develop physical endurance which will minimize aviator fatigue.

The food that an aviator eats is an essential element in achieving total night vision capability. Vitamin A which is found in green leafy foods such as lettuce, celery and carrots strengthens the eyes. Normally, the American diet provides an adequate supply of vitamin A. An excess of vitamin A serves no additional purpose and can cause toxicity. An additional consideration relating to food is to ensure that a meal has been eaten prior to conducting a night flight. Hunger pains that occur under stress tend to divide the aviator's attention and detract from his ability to apply the techniques of night vision.

The development of NOE night training closely parallels space exploration in that the aviator has to adapt to his environment. Once his fear of the unknown is overcome and he believes that he is not helpless in the dark, the Army aviator is ready to further his training in night NOE training.

NOE AT NIGHT *Continued from page 2*

viewing conditions. All aviators had to be in good physical condition and had to be qualified and current in the type aircraft they were flying.

ORVAL: Had the team members been previously trained in daylight nap-of-the-earth operations?

STIFF: The majority of team members had been previously involved in daylight NOE operations, but their experience levels varied greatly. A few team members had approximately 2 years of day NOE flight time, while the least experienced pilot had only a few hours. Three team members had never flown NOE prior to the start of the night experiment.

ORVAL: Did any of the members withdraw from the training during the test?

CHOURA: No, our attrition was due to reassignments.

ORVAL: I understand that personal living habits had to be changed and restrictions imposed. Would you tell us what was required?

ISGRIG: To determine the best performance obtainable, it was decided early in the program to use a sample of aviators drawn from a typical aviator population and also to use unmodified standard A aircraft. To do this, the aviators' physical conditions had to be maximized for night vision and dark adaptation. The aviators were put on a reverse day and night schedule. Sleep and nutrition have an important impact on night vision capability, so the changes in the sleeping and eating schedules maximized the aviators' performance. Special efforts were made to ensure that the aviators had a reasonable opportunity to sleep during the morning and afternoon hours and that their living conditions were comfortable. Efforts were also made to have a full dinner-type meal about midnight. The night training began a few hours after the aviators arose for the day, shortly before nightfall. Training began with the dark adaptation period and continued through two scheduled night periods. There was an attempt to institute physical training, such as volleyball, at the end of the night flights. Aviators were also encouraged to restrict the use of alcoholic beverages and tobacco products and to avoid exposure to bright sunlight. They were encouraged to use dark sunglasses during the daytime and to use red lighting or red goggles during the preliminary evening hours at times before and during flights.

"Night NOE isn't the type flying that any aviator can do for just a few hours a week and maintain proficiency"

COLE: I was one of the team members with a family and the habits which had to be altered at home were tremendous. In fact, it was a complete 180-degree reversal. I would arrive home on Friday and it was virtually impossible to sleep during the daytime when the family was stirring about. Then when I wanted to stay up, the rest of the family wanted to sleep.

CHOURA: It was much easier on the bachelors because they were practically already on a reversed schedule.

ISGRIG: There were also several problems due to the nonavailability of various facilities such as the swimming pool and the theatre, which were closed during the early morning hours. Taking care of personal affairs was another problem. Aviators would have to arise during their sleeping hours to handle their business affairs.

COLE: The aviators were almost socially isolated on this reversed schedule. The only things that were open or available were the PX, baseball diamond and tennis courts.

ORVAL: Could you tell us what type of physical fitness program was employed?

COX: We got the lights turned on at the athletic field so we could play touch football. People knowledgeable in physical training say that volleyball, touch football and this type exercise not only tends to build stamina, but also enables a person to fight off fatigue. Physical exercise also builds the cohesiveness and esprit de corps which are important in any type of training program.

COLE: Many of us played tennis during the day. Some of us drove to King City [California] daily and played golf, which was not only good physically, but also mentally. Some of us needed to relax as we became rather keyed up during missions.

ISGRIG: Physical fitness itself is important as far as ensuring that the aviators were in good physiological condition. This has to do to some extent with the capacity for oxygen uptake which is related to the regeneration of the visual purple [a photosensitive red or purple pigment in the retinal rods] for

dark adaptation. The physical activity is, of course, important for the release of tension. We were successful in getting an organized athletic program here; however, efforts had to be made to encourage an individual to participate.

COX: The athletic program was not a part of the nightly routine, because we only played volleyball or basketball about two nights a week after the flights.

ORVAL: Major Isgrig, would you tell us what type and how often examinations of personnel were conducted?

ISGRIG: There were no physical examinations other than those that were part of the annual physicals. During the first phase of training, we had a program of physiological measurements that we took partly as a data collection effort, but this did not constitute a set of physicals. We made regular recordings of breathing, respiration and heart rates and blood pressure before and after flights. For a period of time we made chemical analysis of urine samples, etc., for stress hormones. With the exception of one individual, there were no long-term changes that indicated any progressive development of stress. Specific time-to-time changes might have reflected specific stresses on certain missions.

ORVAL: Were the aviators given prepsychological tests prior to the experiment?

ISGRIG: No effort was made to screen the aviators in this manner and we did not have personality tests with which we did testing. As part of the program, we did have 2-hour blocks of instruction on visual and physiological factors affecting night vision, such as flash blindness. But there was no specialized training or testing.

COLE: I think the Owl Team members were selected as a group of people in the company that definitely had no known personality conflicts.

ORVAL: So then you couldn't say there were any results that showed an effect on the aviator's progress from one phase of training to the other.

ISGRIG: We had debriefings in which we asked for comments concerning the degree of stress that an individual felt. From these inputs, I don't think there were any longitudinal results in the sense that they changed from phase to phase. But there was a very strong stress pattern with the changes in light levels. There was a higher level of apprehension and discomfort when there was no moon. It was at low altitudes on dark nights that the aviators indicated they were considerably more nervous than they

---

Colonel Billy L. Odneal is a 1950 graduate of Montana State College and has also attended the Army Command and General Staff College and the University of Southern California. Colonel Odneal began his military career in the Navy from January 1944 to April 1946 and remained in the Naval Reserve until December 1948. In June 1950, he entered the Army as a second lieutenant and served as platoon leader with the 65th Infantry Regiment in Korea until he was wounded late in 1950. He was evacuated to the States where he later served as platoon leader and gunnery officer with the 30th Infantry Regiment. In May 1952, he received light aviation pilot training at San Marcos, TX, and since this time has been intimately associated with Army aviation. He is a dual-rated fixed and rotary wing instrument examiner. His assignments include such aviation-oriented positions as aviation instructor; project officer at the U. S. Army Aviation Test Board; CO of Company A, 15th Aviation Battalion, 1st Cavalry Division in Korea; Deputy Director of the Tri-Service V/STOL Test Force at Edwards AFB, CA; CO, 159th Aviation Battalion, 101st Airborne Division, RVN; Deputy CO of Army Lockheed Plant Activity, Van Nuys, CA; CO/Director of Hq and Installation Support Activity (AVSCOM); plus numerous other positions. Since 1972, he has been charged with two major experiments as Chief of Project Team IV, Deputy Chief of Staff for Experimentation, USACDEC, Ft. Ord, CA.—the Attack Helicopter Daylight Offense, in which tactics and equipment evaluations are being performed to allow for a force-on-force exercise to be conducted at a later date, and the Attack Helicopter Clear Night Defense, in which a baseline and training program for night nap-of-the-earth (NOE) flight were determined, as discussed in this interview.

Major Richard L. Cox, a 1960 graduate of West Point, attended the Officers' Fixed Wing Aviation Course in 1963. He served two tours in RVN, commanding the 69th Aviation Co. (Corps) in 1967-1968 and the 74th Reconnaissance Airplane Co. in 1968-1969. MAJ Cox attended Command General Staff College in 1969, obtained a masters degree in business administration from the University of Tennessee in 1972, and attended the Rotary Wing Qualification Course in 1973. During the experiment conducted by the Owl Team, he was assigned as operations officer of Project Team IV, USACDEC, Ft. Ord, CA.

Major Frederick A. Isgrig received his PhD in Experimental Psychology from the University of Arkansas in 1964 and then entered the Army. He has held assignments as research psychologist and human factors specialist at the U. S. Army Natick Laboratories and the USACDEC, Ft. Ord, CA. During the experiments conducted by the "Owl Team," he monitored the aviators to determine what effects night NOE had on them both physically and psychologically.

were with a full moon at higher altitudes.

ORVAL: During daytime NOE training at Ft. Rucker, each aviator is allowed to progress at his own rate, because one aviator might progress from one phase of training faster than another. Was this true during your program?

ISGRIG: Our experiment was conducted in much the same way, but our progress was based on a group consensus.

COX: We were more or less geared to the progress of the most cautious aviator, rather than to that of each individual. If a team member had any reservations about his capabilities to perform a slightly more demanding task, we did not perform the mission until all aviators agreed they were ready to proceed. I'm not sure this would be feasible in a training situation, because an individual who fails to progress as rapidly as others may have to be eliminated from the program. As our experiment was unique, we relied on the group consensus to ensure that we built in every safety feature possible to eliminate the added risk of the unknown.

ISGRIG: We had few preconceptions and standards to use, but we did have a series of stages in mind as far as altitude was concerned. All the Owl Team members were regarded as professional contributors and they were in the best position to judge their own skills and levels of competence at a particular time. The most important instrument in determining this was the debriefing session which was almost a New England town meeting type of discussion. All members enthusiastically participated and very freely volunteered a lot of their valuable opinions. There was very little hesitancy on their part in expressing dissatisfaction or discomfort, and this was encouraged. This was exploratory. These people were paving the way, at least on the basis of our own knowledge. And if someone didn't like something he was encouraged to bring this out and the group discussed it.

ORVAL: In a strenuous training environment such as this, I'm sure there must have been some adverse physical and psychological effects.

CHOURA: One psychological effect unique to night NOE was the bowl-type effect in which the valley seemed to wrap around us. We experienced this while flying low altitude in a large valley with a relatively high light level. Vertigo was never reported during the debriefings. Spatial disorientation, as far as finding yourself on a map, was a problem in some cases. But this worked itself out with experience.

WOLFF: I don't think there were any instances of true vertigo such

---

CW2 Robert L. Wolff joined the U. S. Air Force in September 1959, serving for 8 years. In November 1967, he joined the U. S. Army and graduated from flight school in December 1968. From March 1969 to March 1970, he served with the 334th Aviation Co. (Attack Helicopter) in RVN. CW2 Wolff was then assigned to the 3rd Aviation Co., Yuma Proving Ground, AZ, and then to the 155th Aviation Co. Detachment, Hunter Liggett, CA. He participated as pilot during five of the USACDEC experiments.

CW2 Donald L. Choura entered the Army in November 1959 and received his basic training with the 2nd Armored Division, Ft. Hood, TX. Prior to graduation from flight school in 1970, CW2 Choura was assigned as a light weapons infantryman and parachute rigger with the 82nd Airborne Division, Ft. Bragg, NC; as a parachute rigger with the 109th Aerial Delivery Co., Ft. Lee, VA, and 383rd Aerial Delivery Detachment in RVN; and as recruiter for three years in Los Angeles, CA. From 1970 to 1972, he served as an attack helicopter pilot with the 11th Armored Cavalry Regiment in RVN. He was then assigned as an attack helicopter pilot with the 155th Aviation Co. (Attack Helicopter), Ft. Ord, CA.

CW2 Joe L. Jackson entered the U. S. Army in October 1956 and attended Basic Airborne School in 1958. In May 1967, he graduated from flight school and served two years in RVN. During his first tour he served with the 195th Assault Helicopter Co. and the 240th Assault Helicopter Co. During his second tour he was assigned to the 25th Aviation Co. Corps, the 11th Aviation Battalion, and Hq Co., 12th Aviation Group. He has been assigned to the 155th Aviation Co., Ft. Ord, CA, since March 1972 as a rotary wing aviator.

CW2 John B. Cole graduated from the Rotary Wing Aviation Course in April 1970. He was then assigned to the 155th Aviation Co., Ft. Ord, CA, as a rotary wing aviator where he has participated in Attack Helicopter Daylight Defense, Attack Helicopter Clear Night Defense, and Attack Helicopter Daylight Offense experiments. Prior to entering the Army, CW2 Cole attended Spokane Community College, Spokane, WA, for two years.

CW2 Craig W. Stiff entered the Army in April 1969 and completed his basic training at Ft. Polk, LA. He served one tour in RVN with Battery B-2/20 ARA, 1st Cavalry Division, from which he was then assigned to the 155th Aviation Co., Ft. Ord, CA, in July 1971, as assistant operations officer and as an OH-58 SIP. He has participated in the Attack Helicopter Daylight Defense, Attack Helicopter Daylight Offense, and the Attack Helicopter Clear Night Defense experiments.

as we're concerned with in daylight flying—going into clouds, aircraft becoming attitude unknown, or things of this nature. As the training progressed, we did run into some problems in maintaining firing positions and hovering out of ground effect. To maintain a stationary point at night without outside visual references is almost impossible. We became disoriented to the point that we didn't know whether the aircraft was moving laterally or vertically through space until these movements were greatly increased. Small movements, descent rates, outside rates, lateral movements and drift were virtually unnoticeable.

COLE: During the initial portion of the experiment everyone experienced fixation during approaches on low-light-level nights. We had a tendency to search for the ground and not see it until we were almost on top of it. Early in the program we also had a tendency to stare at one navigation light looking for the ground and sometimes did not realize how fast we were approaching the ground. It was very difficult to determine the rate of descent or closure. One of the hardest things was to convince ourselves that on a low-light-level night it was easier to see close to the ground than at higher altitudes.

COX: All aviators reported that it was difficult to descend from a higher to a lower altitude at night. It was far superior to remain low level throughout the mission profile than to try to descend from altitude into a dark valley.

CHOURA: We made a specific effort to avoid actions which induce vertigo or spatial disorientation, such as rapid movements of the head from side to side. Throughout the entire program we forced ourselves to move our eyes back and forth during approaches to keep from gravitating to a light source or to a navigation light.

COX: This reminds me of one instance of disorientation where we had somebody joining up on the light in a barn door. They were expecting to see a very dim navigation light or station-keeping light on the aircraft that was supposed to be ahead of them. They saw a light source and were flying directly toward it, and it turned out to be a barn that had a light inside. Fortunately, they recognized it was a barn early enough to terminate the join-up procedure.

WOLFF: I don't think these effects can be attributed only to a training environment. All aviators should be aware that these effects multiply when flying close to the ground during any type of night flying.

COX: We found that 1 hour of night NOE may be equivalent to 5 or 6 hours of normal daytime point A to point B high altitude type work. We felt that 3 hours of night NOE were probably the limit that should be required of any aviator.

ORVAL: What safety measures were emphasized during the pretraining phase?

WOLFF: Basically, we tried to base the entire program on safety. We knew we were doing something that was completely unprecedented and in a completely unexplored area. A lot of people have flown low level at night, but to actually try and navigate NOE at night, especially in mountainous terrain such as we have out here and on a large scale, was completely unprecedented. We knew that the slightest incident would cancel the entire program and the environment in which we were flying would probably also cancel the pilot. We were cautious enough and actually scared enough that safety was the byword—the watchword—of the entire experiment. We established SOPs to cover in-flight emergencies such as aircraft mechanical malfunctions, avionics malfunctions, inadvertent IFR and things of this nature. We didn't have to be told that there was no being the hero type if we had an aircraft malfunction. We didn't try to fly the aircraft home; we made a precautionary landing. Our debriefings at the end of each flight, our openmindedness and the openmindedness of our supervisors in letting us do things our own way added tremendously to the program. We sat around and hashed it out about what would happen if this happened or what we would do if that happened and drew our own conclusions. Nobody was afraid to say, "Well, I don't really care for your idea so much. I think it would be better this way." The aviator always had the option to cancel the mission if safety was compromised. The safety measures were just too numerous to really mention. Safety was actually the key to the whole program.

CHOURA: Any aircraft malfunction experienced during any part of the experiment was considered a major malfunction. A malfunction that you would normally fly with during the day, such as an inoperative fuel boost pump, was treated as a major malfunction. The aviator would make a precautionary landing and would not continue with the mission until the problem was resolved. As a matter of fact, the team members considered it rather idiotic to fly an aircraft back with any kind of a systems malfunction.

ISGRIG: Mr. Wolff stated that many aviators have flown low level in many other areas at night. Personnel from other military installations who observed our flying considered the altitudes at which the Owl Team was flying were, in some instances, actually rather high, and

Original 12 Owl Team members are (left to right, front row): CW2 Randy Dyer, CPT Robert Barthelmess, CW2 Ralph Park, CW2 Russell Carmody; (left to right, back row): CW2 John Cole, CW2 Joe Jackson, CW2 Douglas Workings, CPT Edward Foster Jr., CW2 Craig Stiff, CPT Alfred Lopez, CW2 Donald Choura and CW2 Robert Wolff

that perhaps the team was not actually flying NOE. After they became familiar with the terrain at Hunter Liggett, however, they realized why the aviators were flying higher at times. The reservation has 200-foot isolated trees and very steep-sided razorback hills which could be right over the next rise. After all, this wasn't a pool table they were flying on. Extensive navigation and pilotage are required to thread through this rugged terrain at night.

WOLFF: Prior to the experiment, we decided that a radar altimeter was a must. Any time the altimeter malfunctioned during training, we immediately aborted the mission. We used the radar altimeter to give us a trend indication of what the terrain was doing underneath us, rather than using it for a hard and fast altitude. For instance, we might fly over hardwood trees and then over pine trees or vice versa which may or may not give an indication of rising or falling terrain even though the treetops were at the same elevation. However, the radar altimeter would otherwise give a fairly reliable indication if the terrain was falling or rising underneath us. We relied on the radar altimeter quite heavily for safety purposes. In fact, we just didn't fly without it.

ORVAL: Is it correct to say that during the higher light-level conditions the aviators flew lower?

COX: Yes, that's generally correct.

COLE: As far as the light levels, altitude was not as much a factor as airspeed. The higher the light level, the faster I could fly and the more comfortable I felt. But when it was very dark, I actually hovered at times.

ISGRIG: To maintain ground contact, the aviators sometimes flew lower during the lower light levels than during the higher light levels.

WOLFF: We reached a tradeoff point where we could physically make out what was around us. This is why it is difficult to descend to a lower altitude and to that black hole on the ground. We didn't have this positive ground contact and, during the low light levels, we sometimes actually found ourselves at lower altitudes hugging a lateral

bearing more closely. This was particularly true during hovering. The only way we could hold a positive position under extremely low light levels was to snuggle up against a tree and maintain a visual fix on the tree. We would move 50 to 70 feet away from a tree during higher light levels and could still use it for a reference point.

ORVAL: Could you differentiate between your NOE and low-level flying at night?

COX: I don't think we can differentiate between the two as we performed them, except that we tend to define night NOE flight in relationship to the light level and to the enemy threat. We saw no reason to see how low we could fly on an extremely dark night or any other night for that matter. You can safely operate lower under the higher light levels than under the lower light levels, but we think that NOE should be tied in with the threat. That is, if you can avoid enemy detection by flying at 250 feet then there doesn't seem to be any requirement to fly at 5 or 10 feet.

WOLFF: Regardless of the altitudes we flew, the NOE flight techniques we employed were in accordance with TC 1-15 which stipulates that NOE is flown as close to the terrain as obstacles will permit. But when visibility is reduced, you must allow for a higher margin of safety, such as flying higher. The actual flight routes were still devious routes and we used masking terrain as much as possible. We did not fly straight lines; we flew contour and NOE and followed the ups and downs of the terrain. Our actual techniques of flight did not vary greatly from those employed for a highly moonlit night where we have almost daylight type night conditions to those used for a fully dark night. The only thing that did change was our altitude.

Actual NOE flight at night in rugged mountainous terrain like that at Hunter Liggett was completely unprecedented

ISGRIG: You could be flying at 200 feet through the canyons at Hunter Liggett and still have some of the terrain above you.

CHOURA: There were times when even at 200 feet you could watch the top of the trees go by and yet 200 feet through a particular corridor was considered a safe operating altitude. We were technically below the surrounding terrain, but there were still hazards.

WOLFF: Some people thought that all we had to do was to fly a straight line up the middle of the valley and things of this nature. But many times we actually had less lateral clearance on the aircraft than we had vertical clearance with the ground because of the type of terrain. So we had to follow a very strictly defined path.

ORVAL: Were there any flight techniques or safety measures employed during night NOE training that differed from those of daylight NOE?

COLE: The most important thing was the extensive daylight preflight performed before each night's mission. In fact, the Owl Team had quite a reputation for grounding aircraft.

CHOURA: A constant line of communication was developed between the pilot and navigator and their terminology was refined. In other words, you couldn't just say there's a tree on the left, because the tree could be 40 meters away or could be close enough that you could clip it. Just knowing that there is a 5,000-foot mountain in front of you is absolutely worthless. We had to know what was in front of us by 40 or 50 feet. This was accomplished by a constant interplay between pilot and navigator.

WOLFF: Another safety measure mentioned previously was the SOP we developed. An administrative C&C [command and control] aircraft was airborne at all times to keep all aircraft in sight. We did not fly the same routes every night, so one aviator was selected from the team to preplan a route, using only map reconnaissance. Prior to darkness, he would fly and recon the route for wires and other ob-

stacles. He then flew the C&C aircraft that night and if any aviator got lost or disoriented the C&C would have the crewmembers check their maps, return to their last checkpoint and start again. C&C aircraft are employed during daytime NOE, but to a very limited degree compared with that during night operations.

COX: The C&C aviator also accomplished the radio relay in the event there was an accident and we needed to call for crash rescue.

CHOURA: There were times when 500 meters separation put us out of radio communication between the two aircraft, such as when we were hiding on different sides of a hill. We didn't have radios that were capable of transmitting for extended distances—I'm talking about anywhere from 500 to 1,000 meters—because of the terrain at Hunter Liggett. The C&C aviator provided coordination between the aircraft when this occurred.

WOLFF: One thing we had to overcome was the syndrome of what had been common to all Army aviators—that the aircraft commander was God. This was especially true when flying in the back seat of the Cobra [AH-1]. But in NOE, the pilot and navigator must work together. Without a navigator the pilot isn't going anywhere, except into a mountainside. And, of course, the navigator is not going anywhere without the pilot, other than the flightline.

COX: We definitely feel that both crewmembers should be rated aviators.

CHOURA: Not just rated aviators, but night qualified rated aviators.

ORVAL: What would be required of operational units as far as their capabilities to conduct night NOE training?

WOLFF: The prime factor is command emphasis on safety which our entire program was based on. Some units talk and preach safety but do not go to great lengths to enforce it. We were very fortunate in that CDEC personnel as well as our unit personnel strongly emphasized safety. Whenever we needed anything in the realm of safety there were never any questions asked. I dare say that there are very few units anywhere in the world that can bounce a crash rescue helicopter out to areas where their aircraft are flying within a period of 5 minutes. And I'm speaking of having the injured parties on board and en route back to the heliport within 10 minutes. We did have this capability and it had a tremendous psychological effect on us. There were many problems with the inverted schedule which could not be rectified because a small team of personnel just doesn't change the outlook of an entire post as far as operating procedures, operating hours, etc. However, CDEC personnel bent over backwards to provide us with physical exercise and eating facilities.

ISGRIG: Night NOE isn't the type flying that any aviator can do for just a few hours a week and maintain proficiency. The Owl Team members were completely immersed into night NOE but, when there was a break in the program, they lost a great deal of their proficiency which took some time to recover. To undertake night NOE, aviators must commit themselves for a steady period of time. A unit would probably have to set aside aviators for this type of flying and they would have to be placed on an inverted living schedule.

CHOURA: We had a 2-week break for the Christmas holidays and, when we returned, it was almost 4 weeks before we were as proficient as we were prior to the break. I think it was also the consensus of the team members that to train an aviator for night NOE and to maintain any type of proficiency the training must be conducted on a separate unit-type basis. Near the end of the program, Mr. Stiff, Mr. Wolff and I were working a split schedule—checkrides, minimums, instrument training and so forth. After about two weeks of flying from 1½ to 2 hours during the day and then going right into the night schedule, we were dragging. I felt that I was bordering on the area of becoming unsafe.

COLE: One of the ideal solutions for converting a unit into a night NOE outfit would be to put all operations on a night schedule. This sounds impossible, but the unit would have to be isolated in a remote site similar to that of Hunter Liggett.

STIFF: I do not feel that all operational units should be required to be night NOE qualified. Night NOE operations require continuous training and practice. For a unit to be proficient, personnel must always work at night. If the Army wants night NOE pilots or units, it should designate what units should be "night" units. The primary purpose of these units should be to stay proficient. I feel that the Army will lose more aircraft and pilots through fatigue and loss of concentration than to enemy fire, if it assumes that pilots and units can perform daylight missions in conjunction with combat night NOE missions. Most units simply will not be able to maintain the level of proficiency to enable its pilots to safely perform night NOE.

ORVAL: Can you really foresee this, though?

COLE: Yes, I do. It seems feasible to me to remote the 155th somewhere on the Hunter Liggett reservation and operate completely on a night schedule. If a unit had to

become trained in two or three months, I think it's possible.

WOLFF: Allowances could be made. Even if you didn't go into it on a unit basis, if one platoon was designated as a night platoon, you would have to maintain your proficiency. You can't fly one or two nights a week and be on a daylight schedule the rest of the time. Many things could be done on a unit basis such as having recreational facilities, craft shops, special services and things of this nature available. Or just something where the guys aren't going crazy looking for things to do. A night NOE program is feasible if you have cooperation from all post personnel. The key to the whole thing is to get all personnel thinking along the same lines, and not that this is some wierd type of outfit doing some strange stuff at night. Every time the working group saw us we were either in civilian clothes or were sleeping. When they were having a good time, nobody realized what we were doing. The psychological input we got from that was unbelievable. "You guys never work" and things of this nature when, in fact, we were putting in between 10 and 12 hours a day.

ORVAL: I think strict command supervision is a must if we should have platoons that are just night NOE qualified, don't you?

CHOURA: I think the biggest problem will be command support. Commanders must be made aware of the specific problems during night operations that you don't find, particularly say, with a ground unit operating at night. Aviation at night has its own particular set of problems and commanders must know that these are very real problems. Probably the biggest drawback in getting an operational unit trained at night is to convince the command structure that there is a definite problem that has to be coped with before the training can be effective.

ORVAL: Should all aviators receive night nap-of-the-earth training?

COX: I certainly don't think that they should. I agree there should be units identified that have a requirement to possess a night capability and night NOE training should be limited to these units. For one reason, aircraft may be configured differently for night than for daytime operations. Presently, we do not have a night target acquisition system. We can move from point A to point B NOE but, when we reach our destination, our capacity to acquire, detect or identify our target and destroy it at night is very limited. Night NOE training, like the instrument training program, involves a considerable expenditure of resources. It would be quite expensive to provide everyone with this capability just as it's quite expensive to have everybody instrument qualified. While it is desirable that every aviator be capable of performing night NOE operations, I don't think Uncle Sam can afford it. I'm not convinced that every aviator needs to have an instrument ticket from a combat readiness standpoint. As far as I know, there's no requirement to fly instruments in a helicopter in the immediate battle area in a mid-intensity situation. You're vulnerable to being shot down by anti-aircraft because of the altitudes required to fly instruments, to receive radio signals and to maintain clearance from obstructions. I do not think all aviators are capable of responding to this type training and I think that an all-out night program would be extremely wasteful. So, I think prime consideration should be given to aviation units which have a requirement for this type flying.

CHOURA: Physiological restrictions of some aviators will preclude them from flying low level at night and some do not have the capability to see at night. As far as the psychological effect, I'll be the first to admit that night NOE is sometimes scary. I never got as nervous overseas as I did sometimes when flying NOE at night. There is definitely a physiological and psychological restriction that's going to pop up if you try to train everyone in night NOE.

STIFF: The night NOE environment is much more dangerous than the daytime environment. Many times the only way this danger can be mastered is through a very nebulous thing called "feel" or "aircraft sense." This instinct for what the aircraft is doing comes after a certain exposure time to the aircraft. Exposure time varies with individuals but each individual encounters a certain easiness or intimacy with the aircraft that only comes with exposure through flight time. I don't feel new aviators have had enough exposure or possess enough aircraft feel to realize a potentially dangerous situation approaching through a particular aircraft shudder or shake. Flying NOE at night is a two-man operation. Both individuals must be comfortable and place the utmost trust in each other's ability to handle his portion of the task. We also discovered that everyone is not suited for night operations. Many people with totally acceptable day vision suffer problems at night that lead to potentially hazardous situations. Depth perception at night is perhaps one of the biggest problems encountered, especially during approaches. We noticed also that some people cannot emotionally adjust to night NOE.

ORVAL: How were the low, mid and high light levels computed?

COX: We used three more or less

arbitrary light levels which had been used in previous experiments. Low light level was 2.5 times 10 to the minus 4 footcandles which really doesn't mean much to the average individual. This type measurement has more meaning to the scientific-oriented personnel than to the more pragmatic infantry officer or infantry aviator. The mid light was from 2.5 times 10 to the minus 4 footcandles to 3.0 times 10 to the minus 3 footcandles, and high was anything above this. For our purposes, I think that probably two divisions would be more meaningful, that is, it was either twilight or dark. The break point is probably any time you have any fraction of the moon high enough above the horizon to improve night vision.

ISGRIG: The low light level corresponds similarly to no moon, mid light to a partial moon rising, and high light level to a quarter moon at zenith or a full moon after it has risen over the horizon.

COLE: In a practical sense, it was dark, darker and oh, my God!

CHOURA: If a requirement is ever levied on operational units to become qualified, the moon phases will have to be considered. This could extend the training over a longer period of time.

ORVAL: Were any training missions delayed to wait for better ambient light conditions?

COX: Missions were never postponed because of light levels. A mission might be postponed or cancelled due to very low freezing temperatures, precipitation, fog, haze or other obstructions to visibility. When we began originally to investigate the clear night defense, we thought that with an overcast the light would be so low that we couldn't operate. But as the training progressed, we found that we never really encountered a sky condition which prohibited us from operating under extremely low light levels. The lowest light level recorded was .6 times 10 to the minus 4 which is quite dark. We did adjust tasks to permit some training activity during the low light levels.

ISGRIG: Altitudes were progressively lowered. That is, the first descent was made under high light so that the first flights at a new lower altitude under high light would progressively be picked up during mid and low light periods before moving the ship further.

ORVAL: If you had problems when landing at simulated rearming or refueling areas without artificial lighting, how did you overcome them?

WOLFF: We did have problems at first. We always had problems; the heck with at first. Any time we were shooting an approach and couldn't see what we were shooting to, we had problems. The key to this was constant practice and familiarization with procedures and learning new procedures. We found that the navigators could GCA [ground controlled approach] us into these types of areas very well. There were a few areas where a small amount of artificial lighting had to be induced. If we were going into an abandoned airfield or familiar terrain, we could complete the landing without artificial lighting. But to go into a completely unimproved area required some type of lighting due to the many variables of the terrain. An area could look perfectly smooth right down to 3 inches off the ground and then you would find yourself sitting on top of a rock or some other obstacle.

"I feel that the Army will lose more aircraft and pilots through fatigue and loss of concentration than to enemy fire if it assumes that pilots and units can perform daylight missions in conjunction with combat night NOE missions"

COX: It is not unrealistic to have some very dim, well-shielded light source in a refueling area or any type of landing area, because, until we solve the problem of aircraft noise, the enemy can detect us from a certain minimum distance anyway. If you have a light that can be seen from only 50 or 100 meters away, yet the aircraft can be heard from 500 meters away, you really haven't sacrificed security of safety.

CHOURA: We have an old drone airstrip which is a large circle of white-colored concrete. It is probably one of the easiest things in the world to land to, light or no light. We tried using this same concept by painting our PSP [pierced steel planking] panels white, but we didn't get the same effect. There are just some areas that are more conducive to night landing without lights of any type.

WOLFF: I think that the circular shape of this area afforded the most accepted landing site, because we were best able to judge airspeeds, altitudes and things of this nature throughout our approaches. We tried a lot of different setups using artificial lights as well as just light-painted objects, reflective objects and things like this, but none worked as well as a circular landing array.

ORVAL: Tell us how you adapted yourself to a nighttime environment.

COLE: We wore sunglasses anytime we were around lights or out in the sunlight. When possible, lights were always red everywhere we went and we tried to avoid lights prior to the mission. Before each mission, we flew as low as possible and

orbited until we were acclimated to the darkness. When the team members felt they could see as well as possible, we started the mission.

CHOURA: The window shades in our billets were always down to prevent the sunlight from streaming in. Actually, bright sunlight became physically painful after a period of time. A very short exposure, such as 3 to 4 hours, to unshaded light or direct sunlight affected our night vision as much as a week until the visual purple chemical in our eyes could regenerate itself. Some people adapt more quickly to the lower light levels than others, and are more physically capable of operating under reduced light levels. Trying to maintain an inverted or as close to an inverted schedule as possible on the weekends was much easier for the bachelors. We saw many late movies and became reacquainted with W. C. Fields, Shirley Temple and so forth.

ORVAL: Were the aircraft modified in any way for night operations?

WOLFF: Yes. As previously mentioned, we added the radar altimeter which we would not fly without. We also made many changes as far as external lighting, so that when we flew multiple aircraft missions we were better able to see the other aircraft and yet the enemy was less able to see our aircraft. It was supposed to be a passive type of lighting system. The OH-58s were configured with the electroluminescent panels which gave off a very soft glowing light from the upper surfaces of the aircraft and made the aircraft distinguishable from above. It also gave an excellent reference as to our exact position in space. We modified the AH-1Gs with the soft white landing light which was nothing more than a taillight with a slightly opaque lightbulb mounted on the bottom of the turret. In lieu of the electroluminescent panels, we mounted taillights inside the skid tubes looking aft only and placed cones over the taillights so they could be seen to the aft only. We separated the wiring of the navigation lights so that the red and green lights could be turned completely off on the AH-1G. We installed rheostats and we had one rheostat which dimmed only the white lights on the skid tube and taillights. We found on the bright and dim settings that station keeping was completely unfeasible. There were times when bright was too bright and dim was too dim, so we had to fully control the lights. Internal aircraft lighting created a constant problem, such as glare off the canopy on both types of aircraft and instruments not being illuminated to the same degree. The gray-painted aircraft interior presented a reflection problem, so we painted some of the aircraft with a flat, black paint which reduced glare at least 60 to 75 percent.

ORVAL: What effect did artificial battlefield lighting have on night vision and what measures were taken to correct this?

COLE: There were actually two sources of artificial lighting used—artillery simulators and flares. The simulators presented no real problem unless they were directly in front of us or we were looking directly at them. In this situation, we would have momentary night blindness. When we were under a flare it was seventh heaven, because we could see tremendously. But when the flares burned out, we were in trouble, because it was hard to see even on a light night. I don't think that battlefield lights will present much of a problem, unless you have to fly through many flares.

COX: We found that artificial battlefield illumination did not pose the problem that had been expected, because the eye is very adaptable. When we became aware that illumination was to occur at random times, there was no problem.

ISGRIG: During the early training phases, streetlights and automobile headlights were tremendously upsetting to some of the aviators.

CHOURA: Certain techniques were developed to cope with the problems of artificial lighting. For example, a flare burns for about 2½ or 3 minutes before it starts to flicker, dim and go out. When we received the first indication that the flare was going out, we either slowed our airspeed or came to a hover. Again, the time it takes to regain vision is dependent on the individual. Our eyes were automatically drawn to any type of light and this was something we constantly had to fight against.

COLE: A hazardous situation I encountered was during a simulated battlefield operation. I was masked behind a mountain and was hovering under a flare on a low-light-level night. I knew the flare was going to burn out but I didn't move away from it. It's a real hairy feeling to be down there in that hover hole and have the flare go out and it's pitch black.

ORVAL: What measures were employed for mission readiness and what crew duties were expected of you?

WOLFF: All team members except one were qualified in the OH-58 and AH-1G aircraft, and were interchanged between both types of aircraft and crew positions. However, at the end of the program most of us agreed that night NOE is such taxing work that you cannot be fully confident and fully with the program when you are concerned about flying two different

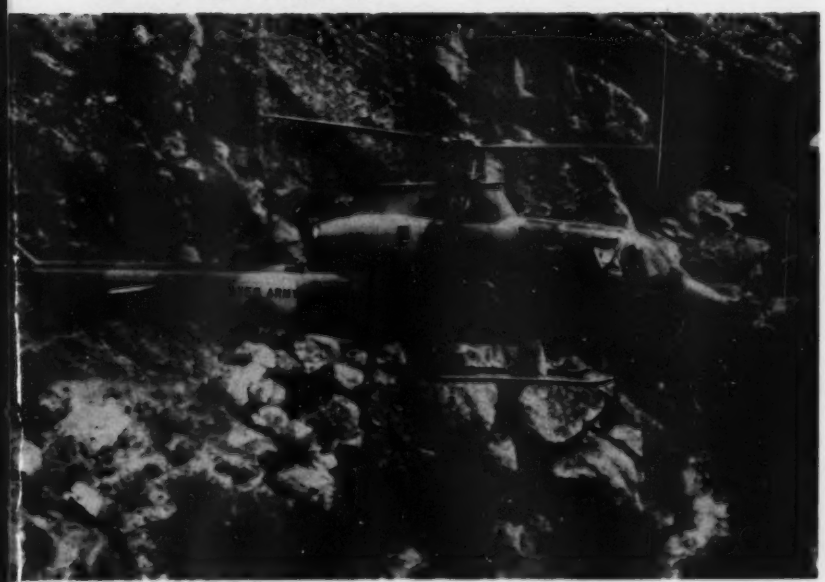
types of aircraft as well as the mission. As far as interchangeability of crew positions, the navigator has to know what the pilot is thinking. You can't be just a navigator and forget about the pilot. So you have to be pilot and navigator both. As far as interchangeability between aircraft, all of us agreed that you must be proficient in only one type of aircraft. When switching from one aircraft to another, some proficiency is sacrificed.

CHOURA: First, night NOE or even night low-level flying is basically a seat-of-the-pants proposition. You have to be able to feel the aircraft and know what it is doing. The worst thing in the world is to get into a situation, such as settling with power, when you aren't familiar with what the aircraft will feel like and how it will react during a certain situation. The only instruments we had time to look at at night were power, airspeed and the radar altimeter. Having to hunt for an instrument when operating close to the terrain creates a definite hazard. Secondly, an extensive amount of map reading and map interpretation is required by the pilot and navigator prior to the mission. For instance, you may spend an hour going over the map prior to a 45-minute flight because of the lighting configuration of the aircraft. Also, the maps we presently have are not suitable for night operations, so we had to memorize or refresh our memory with just a glance. The pilot and navigator had to be aware of the other's problems as well as his own for his particular crew station.

ORVAL: What psychological effect did the crash rescue backup have on the aviators?

CHOURA: Any time an aircraft was airborne, the crash rescue crew was on standby near a radio. At the first sign that something was wrong with an aircraft, the alarm was sounded. Immediately, the crash rescue aircraft was off the ground en route to the site. You didn't have time for radios to warm up and you didn't have time to call the tower. It was a blind takeoff. By the time the radios warmed up, the crash rescue was usually off the ground and moving. Coordination came in a blind transmission from our operations section which would keep transmitting the location over and over again until he finally received a reply. Knowing you were no more than 5 minutes away from help on the route or the reservation was a tremendous psychological boost and allayed our fears. If an aircraft went down in an area in which the rescue aircraft could not land, rappelling facilities and trained crash rescue specialists and medics were available.

AH-1G flying at NOE altitude through canyon. Treacherous terrain made safety the watchword for the entire night NOE experiment



COX: From 1½ to 2 minutes is probably an accurate average figure for the rescue aircraft to become airborne. It would normally take 20 to 25 seconds to get to the aircraft, and about 45 seconds to get untied and power up for takeoff. We tried to get at least one exercise per week with the crash rescue team. I don't think many weeks went by that we didn't exercise the rescue team.

WOLFF: Members of the Owl Team rotated in manning the crash rescue aircraft. We felt that it was unsafe to use personnel who were not familiar with the terrain we were flying over. The aircraft was manned by two aviators, accompanied by one medic and crash rescue specialists who were trained strictly in aviation crash rescue work, such as getting the crew out of the aircraft, turning off the engines and fighting limited fires.

CHOURA: There was always a doctor on call at the installation. If an individual was critically injured, the doctor could be waiting on the pad and there was no need to even change aircraft. If an individual was not critically injured, he could be taken off the crash rescue aircraft and transferred to medevac or to the hospital facility.

COLE: Any time the crash rescue

aircraft was down, the mission was scrubbed.

ORVAL: Were all aircraft capable of similarly performing night operations?

COLE: No, there was a definite difference between all three aircraft. The best aircraft for night NOE was the LOH with the doors off. In the LOH you're looking outside the aircraft all the time. The Cobra was capable for low-level night flying, but it wasn't good. You're right next to the canopy where you can see down and out. And the Huey was really incapable, basically, because the crew is too far removed from the windows to see directly below them.

CHOURA: I flew the UH-1M model in the Rave Course at the Night Vision Laboratory in Maryland. The aircraft can be flown under high light conditions with a well-trained crew. But, again, it's not good by any stretch of the imagination. You have to see and you have to be able to feel where the tips of the blades are, as blade strikes are the greatest hazard during low-level flight. However, in a side-by-side seating position, visibility is restricted to one side. When you turn you have to look out the side closest to you in the UH-1 and OH-58 and you invariably run into an air vent, seam or a handle. In other aircraft, window frameworks are a problem because they create a blockage at one of your key points. Even when flying straight ahead, you are more concerned with what is slightly off to one side rather than what is immediately in front of you. At night your peripheral vision is extremely important and any time there is a blockage or partial blockage of peripheral vision, you're again operating at reduced capability. At some point in any crew station in all three helicopters, we had an obstruction to vision.

ORVAL: What problems were encountered during multiple aircraft operations that differed from single aircraft operations and how were they coped with?

JACKSON: Our initial problem was the selection of a formation that would allow ease of join-up, breakup, emergency aircraft breakup procedures and/or control. A semistaggered trail formation with a 10- to 15-second separation between aircraft was the most applicable. Aircraft exterior lighting was another problem in that the present aircraft lighting configuration is inadequate for night NOE. For example, the OH-58 has a two-position switch for exterior lights—bright and dim. Bright is too bright and dim is too dim for NOE flight. The same holds true with the AH-1G with the exception that it has a steady bright and flashing capability. These light settings are unusable for a 10- to 15-second NOE separation between aircraft. The undesirable hypnotic effect of the rotating beacon was another problem. We tried taping the rotation beacon, but the beacon bulbs kept burning out because of the heating. We did successfully disconnect the lower rotation light on the OH-58. We feel that a variable intensity switch for the exterior light on both aircraft would solve the problem. We modified an OH-58 with four electroluminescent panels for station-keeping with favorable results.

CHOURA: Once a formation was formed, our basic problem was to determine what the other aircraft were doing. This problem was solved by modifying the aircraft with four electroluminescent panels which provided a dish effect when seen from a following aircraft. This dish effect indicated whether the aircraft to your front was in pitch or roll attitude, or sliding to the right or left. Our formation separations were based on a time spacing rather than a physical distance spacing. We allowed 5 to 10 seconds spacing which usually turned out to be five rotor discs. To maintain this relationship to an aircraft in front of you without being able to see small movements of either deceleration or acceleration made it extremely difficult.

ISGRIG: You never actually flew formation, did you?

WOLFF: Yes, we did. We actually tried to fly formation on four or five occasions. We attempted to fly the good old school category A type formation, B formations, echelon left and echelon right, but they were completely unsuitable. For instance, when flying up a canyon, we suddenly found that we had to make a 180. Based on our experience and information from other authorities, there is absolutely no need for a nice tight formation, especially at night, because if one aircraft gets nailed with a missile in a mid-intensity environment, this might set up a chain reaction. Also, if the pilot of the lead aircraft stacks his aircraft up against a tree or a blind canyon wall, the rest of the flight would pile up behind him. This is one reason why we turned to multiple aircraft operations rather than formation flying. Formation flying, as we think of it in daytime at altitude, is completely unfeasible during night NOE.

ORVAL: What airspeeds were considered to be the best for safe flight at the different altitudes flown?

CHOURA: Generally speaking, about 30 to 40 knots was our maximum airspeed unless it was an extremely light night. When we were working on a phase of the experiment or trying to accomplish a mission, I do not believe 40 knots airspeed was ever exceeded. It's again a tradeoff; the slower the air-

speed, the closer we could get to the terrain.

WOLFF: We always tend to comment on our airspeeds as 20 to 30 or 30 to 40 knots and our altitude as 250 feet AGL [above ground level]. But 250 feet AGL is actually about 50 feet above obstacle clearance at Hunter Liggett because of the terrain. On many nights, we were flying at 50 to 100 feet AGL and batting along at 70, 80 and even 90 knots. The aviators became so ingrained in the program that a bright moonlit night presented no challenge to them. So, we have a tendency to base our average altitude and airspeed on those flown on the darkest nights.

ORVAL: Would you say the lower you got the slower you went?

WOLFF: Yes, but our airspeeds and altitudes varied according to the amount of light.

ORVAL: Tell us what you thought of the PVS-5 goggles.

WOLFF: In today's modern advanced technology, the PVS-5 goggles would be outstanding if compressed to the size of a pair of spectacles, and we are holding out for contact lenses. The idea and the concept behind the PVS-5 goggles are great; however, they are uncomfortable and have a very limited field of view. The goggles are not the answer to night flying in their present state [see "Helicopter Low Level Night Operations" and "How Night Becomes Day," May 1973 DIGEST].

COX: The Owl Team learned to fly without the goggles, so they had difficulty in convincing themselves the goggles were of any value.

CHOURA: Why restrict ourselves with the limitations the goggles imposed for a very minimal advantage? Under low-light levels they did not work well and under high-light levels we didn't need them. The problem existed as to what would happen if the goggles failed, as they are subject to failure just as anything else. The ability to read a map with the goggles on is nonexistent. If you are navigating a long route, you either have to memorize the map which is physically impossible or you have to keep putting the goggles on or taking them off.

ORVAL: To what do you attribute your record of 1,800 accident-free flying hours?

WOLFF: One thing was the pilots' attitudes toward the entire program. We did not do anything which we thought was unsafe, because we were already jeopardizing ourselves by flying night low level over strange terrain and doing strange things. The cooperation from the immediate supervisory personnel on Team IV was tremendous. We were never pushed or rushed to accomplish tasks and we didn't have a set goal to meet by a certain time. Our higher headquarters and command personnel backed us all the way. When we set up a hue and cry for certain items which we felt were definitely necessary, we received complete cooperation.

CHOURA: We always had the option to say no to any requests we deemed were beyond our or the aircraft's capability.

WOLFF: Command had to be attuned to what we were doing.

COX: Solutions to problems were usually proposed by the aviators themselves.

COLE: The Owl Team members were not trying to see how low they could fly. During the first 3 or 4 months, they tried to see how low they could get with the naked eye. Quite frankly, I think all this was made possible by command emphasis. I think the key to our successful program can be attributed to supervisory personnel such as COL Odneal and MAJ Cox who let the team conduct the training as they saw fit.

COX: It was really COL Odneal who was the prime supervisory member behind our success. He gave us the guidance which permitted the freedom we possessed. Certainly, the overall credit should go to the Owl Team.

WOLFF: The Owl Team came to a common agreement that, for some reason, when a new program comes into being, it seems that everyone in Army aviation wants to get into the act. But, we, the Owl Team, feel that an aviator should have a minimum number of flight hours before being trained in night NOE. An aviator has to be dedicated and professional as well as experienced. An aviator recently graduated from flight school cannot be put through a course such as this and expected to be fully proficient, because basic time in the aircraft is one of the prime factors. Night NOE is a fulltime job and the U. S. Army Aviation School cannot just touch on this subject and turn out a night NOE trained aviator.

CHOURA: Our recommendation for flight experience prior to night NOE training is a thousand hours minimum aircraft time. It can possibly be done at a 500-hour level, but we feel this is the minimum requirement. Air sense cannot be substituted and an individual has to acquire this before he can learn to do something as strenuous as night NOE.

ORVAL: Gentlemen, I thank you for your time. USAAAVS congratulates you on your display of professionalism, enthusiasm and positive attitude toward safety which made your night NOE experiment a success.

Major John K. Crosley
Director, Physiological Optics Division
U.S. Army Aeromedical Research Laboratory

Light Of My Life

The light distribution of Aircraft Anticollision Beacon System, High Intensity Light (AABSHIL) is almost three times greater than standard anticollison lights

I WAS NEW at the post. My commander had designated me as the safety officer, and I assumed this responsibility with pride. I've been around long enough to realize that safety is a continuing process and we all need to be reminded of that fact. Today, I wanted to become better acquainted with the countryside and work off some deficiencies in my record.

As I walked around the small observation helicopter and went through the routine preflight, I noticed the scud. The "weather-watchers" had told me there was nothing unusual, other than this light haze that floated by on occasion. There really wasn't enough haze for an instrument flight rule (IFR) designation, but it was obvious that horizontal visibility was nothing outstanding. I thought to myself, "Atmospheric smog and haze are certainly a real problem these days."

As Paul, my copilot, approached I couldn't help but be pleased. We had been together in 'Nam for a couple of months, and I had learned to respect his capability and judgment during that time. Seeing me, he yelled, "John, as safety officer, don't you just kick-the-tire-and-light-the-fire?" Paul loved to kid me, and I good-naturedly retorted with a select comment of my own. We worked well together.

As he came closer he pointed to the anticollision light and asked me about it. I had assumed it was the same as always, but upon closer inspection, saw that it was something different. It actually appeared to be two lights in one—a clear one and a red one. Another one of these lights was located in the belly between the skids. Since neither of us had seen anything quite like this and were both curious, I asked Paul to activate the beacon to see what happened. He hollered that the beacon switch had two positions—day and night. I asked him to hit "day." Since I was standing

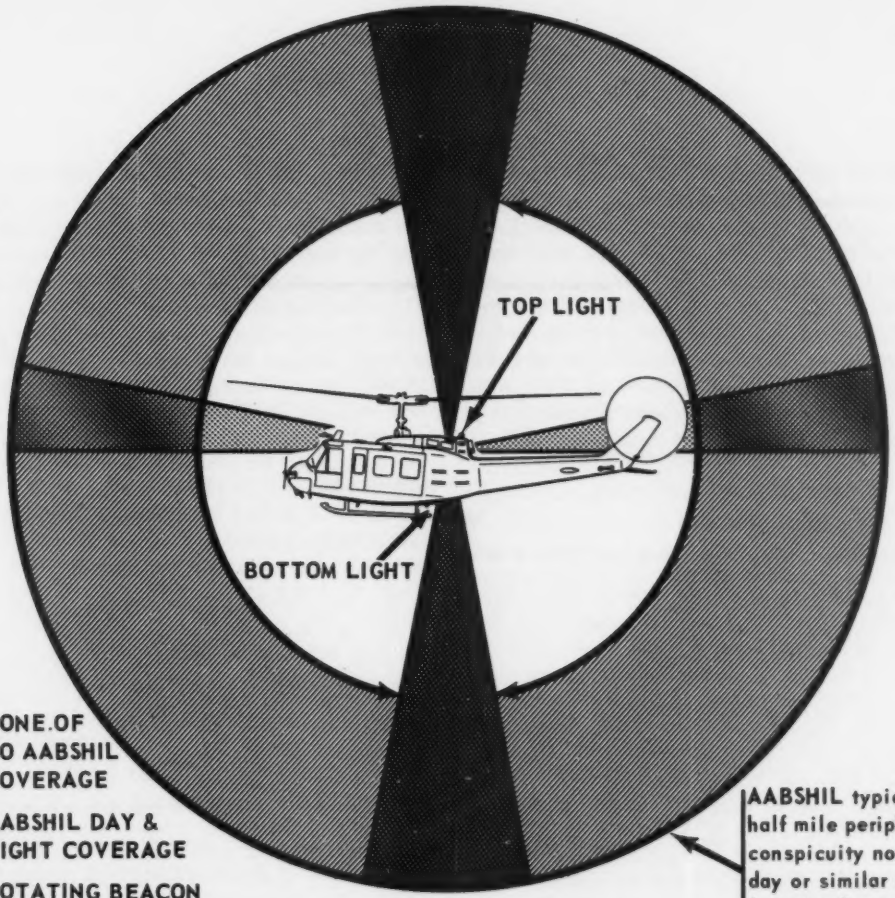
As I watched the instruments, I suddenly felt a hard tug at both the cyclic and collective and heard Paul shout, "I have it!"

very close to the upper lamp when it activated, the thing really surprised me. It was bright and white, and had a sharp rapid flash. He then hit "night," and the red came on. It was considerably dimmer, but the flash rate and sharpness seemed about the same. It was certainly different from anything either of us had seen before, but now it was getting late and we had things to do.

"I've completed the preflight, Paul," I yelled. He nodded and began putting on his helmet. I climbed in beside him and put on my helmet. After the usual checkout procedures, I started the engine and cleared the instrument panel.

Everything looked good, so after receiving clearance from the tower we began to hover on out. Once

AIRCRAFT ANTICOLLISION BEACON SYSTEM, HIGH INTENSITY LIGHT (AABSHIL)


TOP LIGHT
BOTTOM LIGHT
ZONE OF NO AABSHIL COVERAGE
AABSHIL DAY & NIGHT COVERAGE
ROTATING BEACON NIGHT COVERAGE
AABSHIL typical one-half mile peripheral conspicuity non-sunny day or similar contrast (rotating beacon provides no daylight conspicuity)

COMPARATIVE VERTICAL LIGHT DISTRIBUTION

REMAINING EFFECTIVE CANDELAS (APPROXIMATE)				
VERTICAL ANGLE	PERCENTAGE	ROTATING BEACON EFF CANDELAS	AABSHIL EFF CANDELAS	
		DAY & NIGHT	DAY	NIGHT
+90°	0	0	0	0
+80°	0–10	0–10	0–350	0–20
±45°	10–25	10–25	350–875	20–50
±20°	25–50	25–50	875–1750	50–100
±10°	50–100	50–100	1750–3500	100–200
±5–0°	100	100	3500	200

NOTE: (+) is considered to be outward from base of light installed on aircraft.

MARCH 1974

Major John K. Crosley
Director, Physiological Optics Division
U.S. Army Aeromedical Research Laboratory

Light Of My Life

The light distribution of Aircraft Anticollision Beacon System, High Intensity Light (AABSHIL) is almost three times greater than standard anticollison lights

I WAS NEW at the post. My commander had designated me as the safety officer, and I assumed this responsibility with pride. I've been around long enough to realize that safety is a continuing process and we all need to be reminded of that fact. Today, I wanted to become better acquainted with the countryside and work off some deficiencies in my record.

As I walked around the small observation helicopter and went through the routine preflight, I noticed the scud. The "weather-watchers" had told me there was nothing unusual, other than this light haze that floated by on occasion. There really wasn't enough haze for an instrument flight rule (IFR) designation, but it was obvious that horizontal visibility was nothing outstanding. I thought to myself, "Atmospheric smog and haze are certainly a real problem these days."

As Paul, my copilot, approached I couldn't help but be pleased. We had been together in 'Nam for a couple of months, and I had learned to respect his capability and judgment during that time. Seeing me, he yelled, "John, as safety officer, don't you just kick-the-tire-and-light-the-fire?" Paul loved to kid me, and I good-naturedly retorted with a select comment of my own. We worked well together.

As he came closer he pointed to the anticollision light and asked me about it. I had assumed it was the same as always, but upon closer inspection, saw that it was something different. It actually appeared to be two lights in one—a clear one and a red one. Another one of these lights was located in the belly between the skids. Since neither of us had seen anything quite like this and were both curious, I asked Paul to activate the beacon to see what happened. He hollered that the beacon switch had two positions—day and night. I asked him to hit "day." Since I was standing

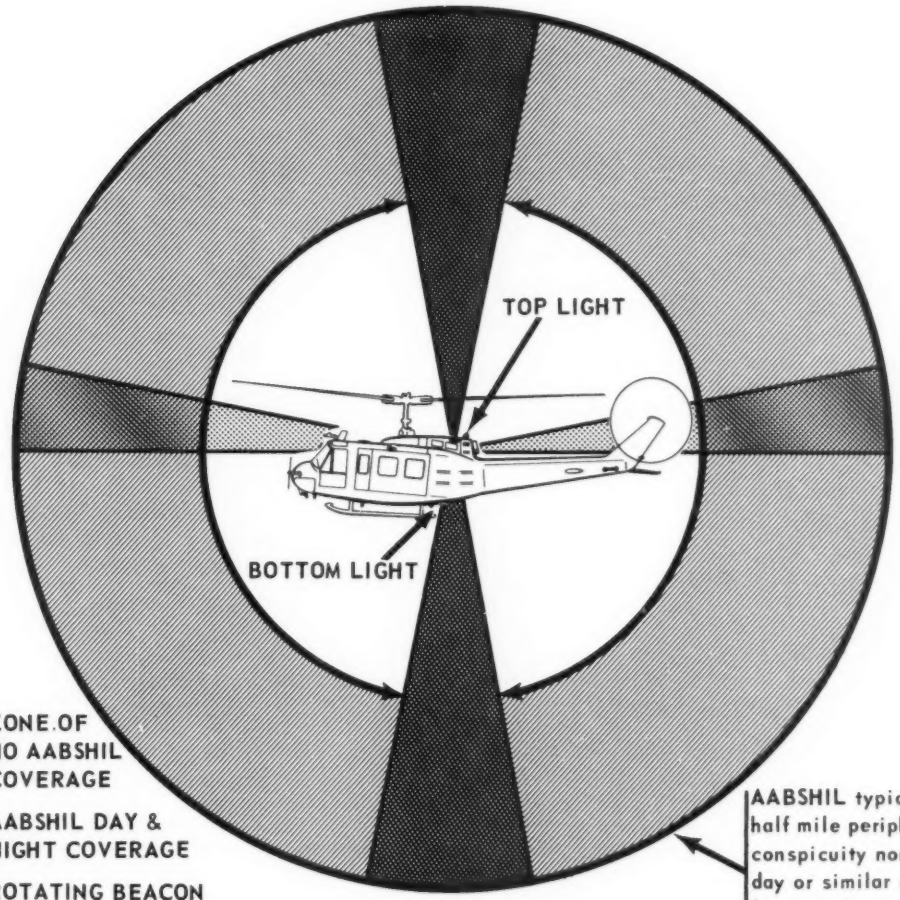
As I watched the instruments, I suddenly felt a hard tug at both the cyclic and collective and heard Paul shout, "I have it!"

very close to the upper lamp when it activated, the thing really surprised me. It was bright and white, and had a sharp rapid flash. He then hit "night," and the red came on. It was considerably dimmer, but the flash rate and sharpness seemed about the same. It was certainly different from anything either of us had seen before, but now it was getting late and we had things to do.

"I've completed the preflight, Paul," I yelled. He nodded and began putting on his helmet. I climbed in beside him and put on my helmet. After the usual checkout procedures, I started the engine and cleared the instrument panel.

Everything looked good, so after receiving clearance from the tower we began to hover on out. Once

AIRCRAFT ANTICOLLISION BEACON SYSTEM, HIGH INTENSITY LIGHT (AABSHIL)



ZONE OF NO AABSHIL COVERAGE

AABSHIL DAY & NIGHT COVERAGE

ROTATING BEACON NIGHT COVERAGE

AABSHIL typical one-half mile peripheral conspicuity non-sunny day or similar contrast (rotating beacon provides no daylight conspicuity)

COMPARATIVE VERTICAL LIGHT DISTRIBUTION

REMAINING EFFECTIVE CANDELAS (APPROXIMATE)				
VERTICAL ANGLE	PERCENTAGE	ROTATING BEACON EFF CANDELAS	AABSHIL EFF CANDELAS	
		DAY & NIGHT	DAY	NIGHT
+90°	0	0	0	0
+80°	0–10	0–10	0–350	0–20
±45°	10–25	10–25	350–875	20–50
±20°	25–50	25–50	875–1750	50–100
±10°	50–100	50–100	1750–3500	100–200
±5–0°	100	100	3500	200

NOTE: (+) is considered to be outward from base of light installed on aircraft.

airborne, I automatically began scanning my airspace. Pure force of habit, but a good one—personal experience had taught me that. My thoughts went back to that first close call while still in basic flight training at Ft. Wolters, TX. It was after I had soloed and was trying to build my air time. I was shooting a few landings at a stagefield along with, I thought, six other guys. After making a touchdown, I checked to see where the others were and began my climbout.

We had barely averted a midair!

Suddenly, a guy descended from above. We missed by only inches as he went down just ahead of me. My hands were shaking so badly I could hardly hold the controls long enough to make another pattern and land. As it turned out, the other guy had never seen my ship at all! When we sat in the break room later and discussed what had happened, there were the usual statements: "It was a freak thing," "Never happen again," "Gotta keep those eyes open," etc. But I had learned a lesson, and since that time I keep my head on a swivel. It's paid off many times.

Our schedule today called for some hood time, so after giving the controls to Paul, I reached down and got out the blinkers. Quite frankly, I hated to wear the thing, but local policy required it.

After taking the controls back, I began to fly our prescribed route. Things were uneventful for a period of time, and I was thinking about calling my wife, Jane, when we got back. Following a small spat that morning, I had said a few things I now regretted. No sweat, a phone call would patch things up again! Perhaps we could take the sailboat out to the lake this weekend. No, that's what the words were about. I wanted a new boat and she wanted some new furniture.

Even with the hood on, it's possible to see out of the aircraft, and I couldn't help noticing that our forward visibility was poor. I mentioned this to Paul, and he said he could barely see the ground.

As I watched the instruments, I suddenly felt a hard tug at both the cyclic and collective. Simultaneously, I heard Paul shout, "I have it!" I released the controls and looked up while pulling the hood off. We had started a sharp right descent, and now we were again stabilizing. I could see nothing unusual. Then Paul explained what had happened.

While making an outside scan, he had picked up a white light in his left periphery. Turning left to identify it, he definitely saw the sharply flashing light, and only the faint outline of another helicopter on a direct collison course with us at about 270 degrees. He had taken the controls as he did because there simply was not time to do anything else. He said it appeared as though the other guy had seen us about the same time, since he had moved smartly to the left. We had barely averted a midair!

We had completed our flight, so we proceeded to return to the airfield. Neither of us said much during the trip back. After shutdown, I realized how tense I was. It doesn't take many instances like that to make an old man out of you.

The first thing Paul did was to again apologize for the way he took the controls. I told him I was glad

We would have never seen the other aircraft had it been equipped with only the standard rotating beacon

he had! Then he looked at the new anticollision beacon and stated that if the other aircraft had had only the standard rotating beacon he would never have seen it.

Since that time, I have been a real believer that the "see and be seen" concept is still very valid. In subsequent safety classes, I have stressed the value of the new lighting system.

Since only a few of our aircraft are equipped with the new system, I decided to conduct a little research of my own. I have asked our pilots to report to me how many times they could see the standard rotating anticollision beacon before they saw the aircraft and silhouette during various daylight hours. The study has been going on for several months now, and they

(nor I) have *never* seen the light first! If you don't see the light first, it is of no value and during daylight hours it might just as well be turned off!

On the other hand, the new strobe light has been seen several times during the day before the aircraft was sighted (especially on one occasion which I remember quite well), even though we only have a few systems installed so far. I'm mighty glad the research people are still interested in my kind of safety.

• • •

The above story generally depicts a true situation that occurred at Ft. Rucker, AL, while research was being conducted on an improved anticollision beacon. The test item was mounted on a TH-13T and, although the pilot who saw the light did not know about the program nor the light, the flash attracted his attention and possibly saved his life. He stated that he never did see an aircraft, and was convinced they would have collided had that light not been seen.

Research on an improved anticollision beacon was begun in 1967 by the U. S. Army Aeromedical Research Laboratory (USAARL), Ft. Rucker, AL. An in-flight study was conducted at Ft. Wolters, TX, in 1969. In 1970, a materiel need (MN) document was written by the then Combat Development Command (Aviation) in conjunction with USAARL, and AABSHIL (aircraft anticollision beacon system, high intensity light) was born. Personnel from the U. S. Army Aviation Systems Command, St. Louis, MO, have been instrumental in formulating and implementing the MN. The U. S. Army Agency for Aviation Safety, Ft. Rucker, AL, has been interested in this program for several years, and has been a major factor in the success attained to date.

Presently, plans call for procurement of the new lighting system (AABSHIL) in 1974, with fleet retrofit starting the same year. Hopefully, this significant safety advancement will have been installed on all Army aircraft by 1976.

Briefly, the new system will include two individual beacons, each beacon having separate day and night modes. The source of light is a xenon gas-filled discharge tube (so-called strobe). The day mode will be white light with a minimum initial output level of 3500 effective candelas, while the night mode will be red with an output of 150 (minimum) to 200 (maximum) effective candelas. The light sources for either day or night modes are phased to flash alternately with a combined flash rate of 90 to 110 cycles per minute. The system weight and power drain are designed to be compatible with the smaller army aircraft capabilities. The remainder of the system is comprised of aircraft wiring, a power supply and a mode selector switch.

The new anticollision beacon system is an improvement over the present rotating beacon in the following ways:

• The day mode provides a significant amount of conspicuous information during daylight hours when approximately 90 percent of midair collisions occur. Essentially no daylight information is available from the old system. (The old system also generally consists of only one light source, either top *or* bottom mounted.)

• The flash characteristic is sharp (approximately one millisecond duration) and very conspicuous.

• The "beam spread" or vertical light distribution is almost tripled over the old system. Thus, a banking aircraft or one viewed from above or below the horizontal plane is more readily seen.

• The system is solid-state, thus eliminating moving parts and improving the reliability in high vibration environments such as found on aircraft.

• The intensity levels have been increased to 3500 effective candelas (white) for day and 150 to 200 candelas (red) for night. The present rotating beacon is required to have only a minimum of 100 effective candelas output.

• The system is noncooperative. Other aircraft can see the light without having a system of their own.

• In combat, the daytime light can be used when over friendly terrain, and extinguished in enemy territory.

• Efforts are presently being made to obtain tri-service agreement to standardize this system on all rotary and subsonic fixed wing aircraft where possible. Routine maintenance and replacement parts would thereby be available at any military airfield.

USAASO Sez

SITTING AROUND WITH the boys at the Flying Round House the other day, one of the local "squares" just couldn't make the ends meet on circling approaches. He flitted around all the quadrants but couldn't seem to put all the pieces in a box. Gone are the days when boxing field meant aligning with a runway during low visibility and flying a 1-minute 90 degree box pattern of left turns to place yourself in a position to land. The box you'd get now might be the box you wish to avoid for many years.

It takes only a few moments to straighten out both squares. First, a 1-minute leg box pattern would most likely take you out of the TERPs circling area for which obstruction protection is provided. Stay in the circling area provided and avoid boxes with antique handles.

Second, a circling approach is a maneuver often conducted in weather conditions below VFR minimums in visual contact conditions. It is an extension of the IFR operation and traffic patterns should be left turns unless otherwise directed or restricted. Tower will normally provide the directions at controlled airfields and the controller really means, make a left turn to final when he speaks "left traffic" or "left base" to runway so and so. Comply with this. If in doubt get with the controller and follow instructions to the letter. Also, comply with restrictions which may be found on the approach chart or in the remarks section of the IFR Supplement when doing your thing at an uncontrolled airfield. At uncontrolled locations, do your planning thing and also check the wind T for valuable clues which may not be published.

Third dimension is how high? Well, why low? Fly published traffic pattern altitudes when possible. Never fly below minimum descent altitude (MDA) until turning to final for landing on the assigned or proper runway—unless you are interested in a stopping over at "Never, Never Land." Go full circle only if necessary and legal. The circling MDA and weather minima to use in planning and operations are those in the procedure associated with the published final approach to a runway or airport.

Pilot judgment is the most critical element in the successful accomplishment of a circling operation. Consult notes that may tell you of obstructions that exist in certain quadrants or directions and that lighting may not exist on some runways. See and be seen rules exist. USAASO SEZ every clue and judgment used helps avoid buying the farm.

Standardization Conference

The Department of the Army Flight Standardization Policy Board Conference, hosted by the Headquarters, First U. S. Army, was to be held on the 18th and 19th of this month in Washington, DC.

The agenda for the conference is shown below and was formulated on the basis of recommended items submitted by policy board members. Proponents of each item were to provide a brief presentation to develop the full scope and ramifications of the topic.

TOPIC

Keynote Address

Moderator's Overview

Department of the Army Standardization Comments

Army Aircraft Operator's Manuals and Checklists

Discussion

Instructor Pilot/Standardization Instructor Pilot Written Examination

Discussion

Standardization Evaluation of Instrument Flight Examiners

Discussion

Flight Standardization Training Packets

Discussion

Multitrack Instructor Pilot Course Concept

Discussion

Instructor Pilot/Standardization Instructor Pilot Training

Discussion

TOPIC

Open Discussion

Crew Chief Standardization

Discussion

Frequency of Standardization Board Meetings

Discussion

Latitude of U. S. Army Aviation School Standardization Instructor Pilots

Discussion

Accidents Occurring During Standardization Rides

Discussion

Paragraph 4-23(1)(b)

Discussion

Paragraph 1-12 and 1-18, AR 95-63

Discussion

"Why Train For Accidents?"

Discussion

Open Discussion

Closing Remarks

Next Month :
The DIGEST Will Take A Comprehensive Look At The Army's Flight Standardization Program.

Standardization Conference

The Department of the Army Flight Standardization Policy Board Conference, hosted by the Headquarters, First U. S. Army, was to be held on the 18th and 19th of this month in Washington, DC.

The agenda for the conference is shown below and was formulated on the basis of recommended items submitted by policy board members. Proponents of each item were to provide a brief presentation to develop the full scope and ramifications of the topic.

TOPIC

Keynote Address

Moderator's Overview

Department of the Army Standardization Comments

Army Aircraft Operator's Manuals and Checklists

Discussion

Instructor Pilot/Standardization Instructor Pilot Written Examination

Discussion

Standardization Evaluation of Instrument Flight Examiners

Discussion

Flight Standardization Training Packets

Discussion

Multitrack Instructor Pilot Course Concept

Discussion

Instructor Pilot/Standardization Instructor Pilot Training

Discussion

TOPIC

Open Discussion

Crew Chief Standardization

Discussion

Frequency of Standardization Board Meetings

Discussion

Latitude of U. S. Army Aviation School Standardization Instructor Pilots

Discussion

Accidents Occurring During Standardization Rides

Discussion

Paragraph 4-23(1)(b)

Discussion

Paragraph 1-12 and 1-18, AR 95-63

Discussion

"Why Train For Accidents?"

Discussion

Open Discussion

Closing Remarks

Next Month :
The DIGEST Will Take A Comprehensive Look At The Army's Flight Standardization Program.

20 mm Fuze Test Fired At Rucker

During late January this year, an AH-1J Sea Cobra was flown on the Ft. Rucker, AL, ranges to evaluate M-56 20 mm fuze sensitivity using the XM 97 turret and XM 197 gun. An improved sight was installed on the aircraft which had been provided by the Bell Helicopter Company, as were the pilot and technical personnel for this test.

Brigadier General James M. Leslie, Assistant Commandant of the U. S. Army Aviation Center (top photo), climbs aboard prior to his flight down range as gunner on the initial day of testing. Mr. Ward Carstenson, Bell Project Director (right), checks the aircraft prior to the flight. The photo below captures one of the runs during which General Leslie fired the system.

Numerous evaluations were made at ranges from 1,000 to 2,500 meters and altitudes of 0, 50, 100 and 200 feet. At this writing comprehensive results were not available from Bell. However, those participating in the test were enthusiastic. The DIGEST plans a feature on the M-56 20 mm fuze in a future issue.